A Database Publication

THE MICRO USER

Volume 6
Number 1
March 1988
£1.25

Top-selling guide
o the BBC Micro, Master,
Archimedes and Z88

REPTON

All the answers in our mini-magazine

CHALLENGE

Test your skill at programming

LASERS

Printing at the speed of light

Z88

- Going online
- Backup utility
- Addition game

UTILITIES

- Graphic compiler
- Ram-save routines

REVIEWS

- Ice King
- OverView
- Genie Utilities

. . . plus all the latest games

Be a real-life adventurer
Your invitation is on Page 36

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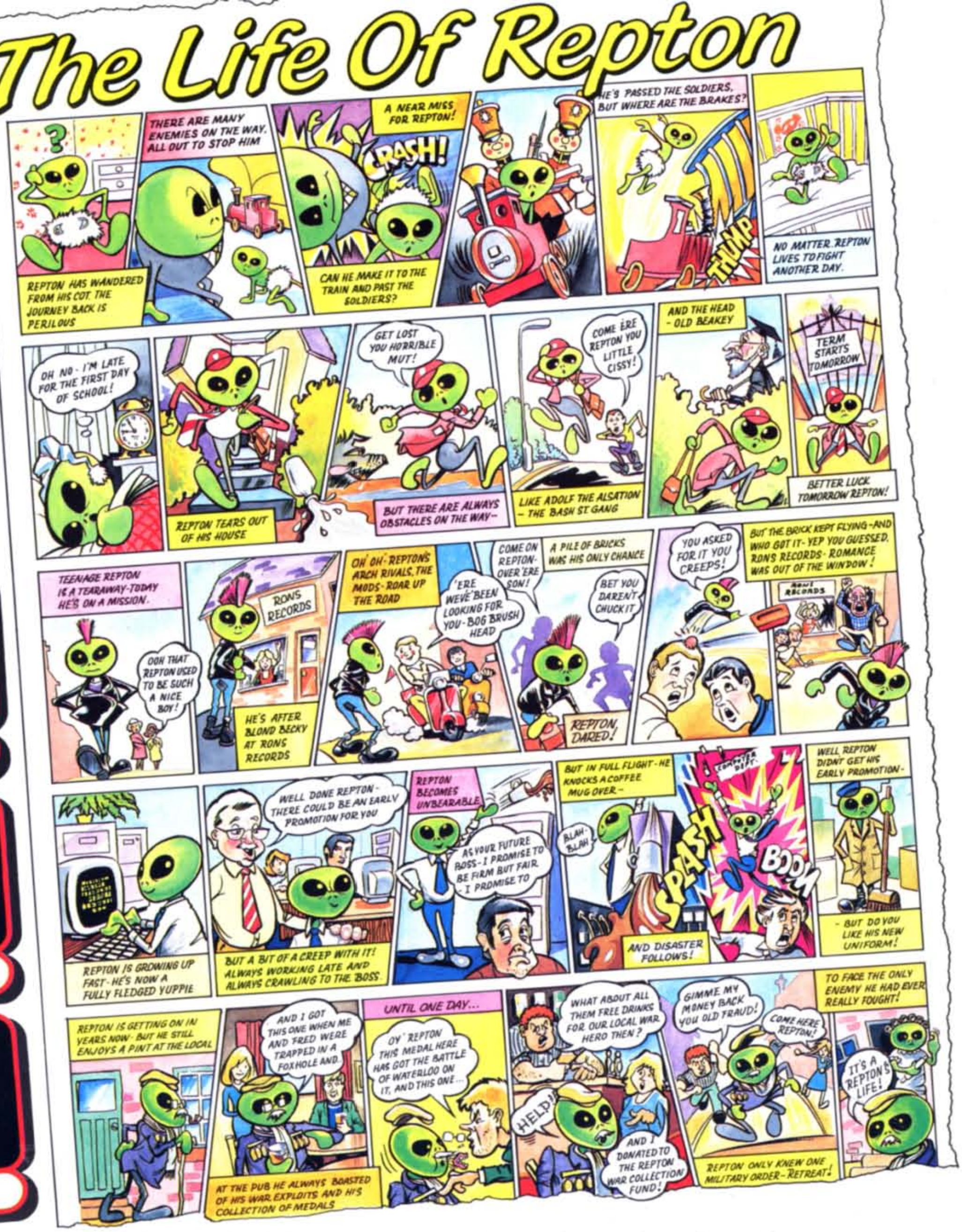
The Life Of Repton
THERE ARE MANY ENEMIES ON THE WAY. ALL OUT TO STOP HIM
A NEAR MISS FOR REPTON!
CRASH!
HE'S PASSED THE SOLDIERS, BUT WHERE ARE THE BRAKES?
REPTON HAS WANDERED FROM HIS COT. THE JOURNEY BACK IS PERILOUS
CAN HE MAKE IT TO THE TRAIN AND PAST THE SOLDIERS?
THUMP
NO MATTER. REPTON LIVES TO FIGHT ANOTHER DAY.
OH NO - I'M LATE FOR THE FIRST DAY OF SCHOOL!
GET LOST YOU HORRIBLE MUT!
COME 'ERE REPTON YOU LITTLE CISSY!
AND THE HEAD - OLD BEAKEY
TERM STARTS TOMORROW
REPTON TEARS OUT OF HIS HOUSE
BUT THERE ARE ALWAYS OBSTACLES ON THE WAY—
LIKE ADOLF THE ALSATION - THE BASH ST GANG
BETTER LUCK TOMORROW REPTON!
TEENAGE REPTON IS A TEARAWAY-TODAY HE'S ON A MISSION.
RONS RECORDS
OH OH- REPTONS ARCH RIVALS, THE MODS- ROAR UP THE ROAD
COME ON REPTON- OVER 'ERE SON!
A PILE OF BRICKS WAS HIS ONLY CHANCE
YOU ASKED FOR IT YOU CREEPS!
BUT THE BRICK KEPT FLYING - AND WHO GOT IT - YEP YOU GUESSED. RONS RECORDS - ROMANCE WAS OUT OF THE WINDOW!
OOH THAT REPTON USED TO BE SUCH A NICE BOY!
HE'S AFTER BLOND BECKY AT RONS RECORDS
'ERE WE'VE BEEN LOOKING FOR YOU - BOG BRUSH HEAD
BET YOU DAREN'T CHUCK IT
REPTON, DARED!
RONS RECORDS
WELL DONE REPTON - THERE COULD BE AN EARLY PROMOTION FOR YOU
REPTON BECOMES UNBEARABLE
AS YOUR FUTURE BOSS - I PROMISE TO BE FIRM BUT FAIR - I PROMISE TO
BUT IN FULL FLIGHT - HE KNOCKS A COFFEE MUG OVER—
BLAH-BLAH
COMPUTER DEPT.
SPASH
BOOM
WELL, REPTON DIDN'T GET HIS EARLY PROMOTION -
REPTON IS GROWING UP FAST - HE'S NOW A FULLY FLEDGED YUPPIE
BUT A BIT OF A CREEP WITH IT! ALWAYS WORKING LATE AND ALWAYS CRAWLING TO THE BOSS.
AND DISASTER FOLLOWS!
- BUT DO YOU LIKE HIS NEW UNIFORM!
REPTON IS GETTING ON IN YEARS NOW - BUT HE STILL ENJOYS A PINT AT THE LOCAL
AND I GOT THIS ONE WHEN ME AND FRED WERE TRAPPED IN A FOXHOLE AND...
UNTIL ONE DAY...
OY' REPTON THIS MEDAL HERE HAS GOT THE BATTLE OF WATERLOO ON IT, AND THIS ONE...
WHAT ABOUT ALL THEM FREE DRINKS FOR OUR LOCAL WAR HERO THEN?
GIMME MY MONEY BACK YOU OLD FRAUD!
COME HERE REPTON!
TO FACE THE ONLY ENEMY HE HAD EVER REALLY FOUGHT!
IT'S A REPTON'S LIFE!
AT THE PUB HE ALWAYS BOASTED OF HIS WAR EXPLOITS AND HIS COLLECTION OF MEDALS
HELP!
AND I DONATED TO THE REPTON WAR COLLECTION FUND!
REPTON ONLY KNEW ONE MILITARY ORDER - RETREAT!

REPTON AS A BABY

REPTON AT SCHOOL

REPTON AS A TEENAGER

REPTON AT WORK

REPTON AS AN OLD MAN

Repton fans have begged, cajoled and pleaded with us to release another set of screens for our Repton 3 game. How could we refuse? Our lovable hero returns again to star in 40 new screens that vividly depict Repton's life-story.

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THE SCREEN EDITOR

THE CHARACTER EDITOR

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The Micro User welcomes program listings and articles for publication. Material should be typed or computer-printed, and preferably double-spaced. Program listings should be accompanied by cassette tape or disc. Please enclose a stamped, self-addressed envelope, otherwise the return of material cannot be guaranteed. Contributions accepted for publication will be on an all-rights basis.

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Save money on bargain offers from fellow readers. Turn to Page 156

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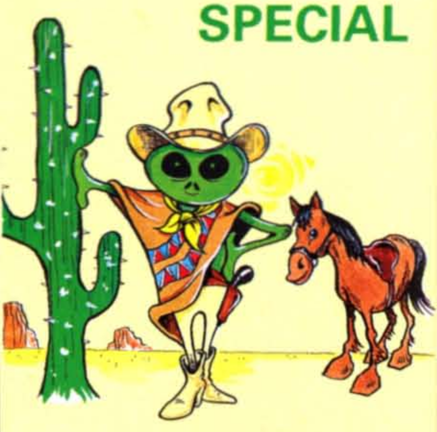
REPTON
SPECIAL



Straight from the lizard's mouth: All the facts, news and gossip in our cut-out and keep supplement.

Plus a great screen designer competition with £600 worth of Superior games to be won.

It's between Pages 72 and 77.

Fifth Birthday Competition and Survey

Over £1,000 of software to be won in our fifth birthday prize draw competition. And an invitation to make your opinions known with the great Micro User survey.

Both are on Page 97.

NEXT MONTH

GAME
Go for double top with darts
UTILITY
Designer pages for fax filers
GALLERY
Superb Archimedes screens
REVIEW
Low-cost Epson laser printer

THE MICRO USER

April 1988 issue on sale March 2

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A268

Acorn breaks into Japanese market

ACORN Computers has pulled off a major coup by winning an order from Japan for British computer technology.

The company is to install 40 BBC Master 128 micros linked by Econet for the Japanese Ministry of Foreign Affairs.

The system will be used to teach English to aspiring diplomats who will eventually work abroad.

Acorn is also supplying a Domesday system to give the Japanese students practical background on Britain today.

Although the deal is initially only worth £40,000, it has far-reaching significance for Acorn.

Firstly it opens the door to further contracts from the Japanese Government which has a large requirement for English teaching technology.

Secondly, a vast number of language schools in Japan could now follow their government's example by buying Acorn equipment.

Acorn spokesman Michael Page told *The Micro User:* "Naturally we are delighted to have achieved a foot in the Japanese door – particularly as it has been accomplished in the face of some strong and impressive competition.

"We're confident that we can build further success in Japanese education markets from this starting point.

"A major factor in the breakthrough was the availability of a great variety of top class educational software for our machines.

"The British Council establishment in Tokyo carries an extensive range of these programs and I'm sure the non-government language schools in Japan will now be inspired to take a look at it.

"The Domesday system created quite an impression at the Ministry of Foreign Affairs because of its ability to present a huge database of current UK information to their diplomats coming to this country.

"And of course it presents much of this information in colloquial English so that students can get a feel for English as it is used, rather than as it is taught".

Achimedes on line

MODEM specialist Dataphone has launched Deputy, the first comms package for the Archimedes.

Providing micro-to-micro linking facilities, it also permits users with suitable modems to access Prestel, MicroLink/Telecom Gold and similar systems supporting either viewdata or scrolling terminal type software.

The modem has been designed around the Dataphone Demon II and Designer modems, but will work with most communications hardware – including Pace and Miracle models.

When linked with Demon II or Designer modems, Deputy will give auto baud setting and a 300-number memory for auto dialling – a feature also available when the package is linked to some other modems, including Magic and Apollo.

Other features of the package include the ability to work in Xmodem or CET formats for downloading and uploading software, and compatibility with almost any system running at any baud rate the user's modem can support.

Deputy allows viewdata frames to be saved to disc or printed with a single keystroke.

In terminal mode on systems such as MicroLink, calls can be recorded and reviewed at a later date. Deputy costs £55.40 from Dataphone (0733 230240).

THE HARD SELL

ACORN's new managing director, Harvey Coleman, has already made it clear that the company will be concentrating its attention on aggressive marketing in the coming months.

"The reputation that the company has for producing superb products is one that I shall proudly guard," he told *The Micro User*.

"But I am keen that those products should enjoy the commercial success they surely deserve.

"I shall be making it my priority to capitalise on the market leadership we hold in the education sector and to expand into other areas", he added.

Joseph Lambert

Micro check for Joseph

A CONCERNED father is hoping that an entry in The Micro User Innovation Award 1987 will help with the treatment of his four-year-old diabetic son Joseph.

Greg Lambert of Suffolk rang The Micro User *to enquire about the program – a runner-up in the competition – which allows a BBC Micro to monitor sugar levels and, where necessary, take action to remedy imbalance.*

After contacting the author of the software – Barry Hall of Maidstone – The Micro User *was able to provide Greg with a complimentary copy of the package.*

"This will make it a lot easier for us to check Joseph's blood glucose levels and also with the aid of a daily graph we will be able to react to any inconsistencies immediately," he said.

The family's BBC Micro will now prove an invaluable aid to little Joseph's daily life, allowing him more time and freedom to indulge in his favourite activities.

One is raising money for research into diabetes, and after a sponsored climb of Ben Nevis last year which raised £2,500 Joseph is now looking forward to his next event.

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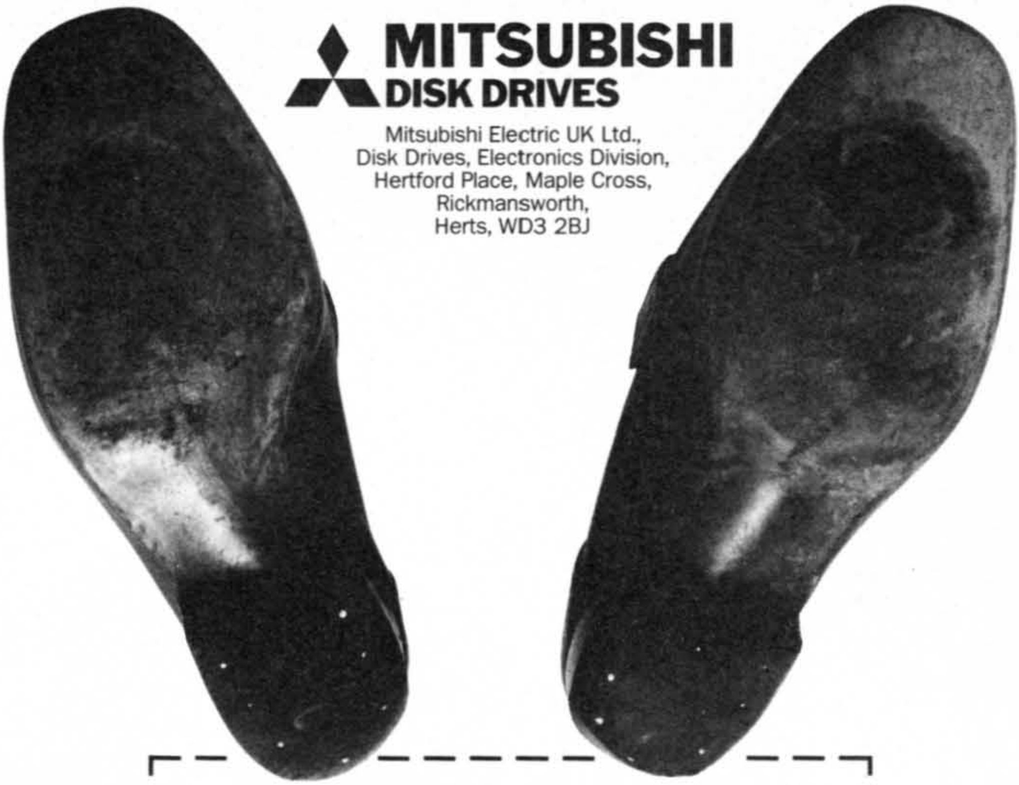

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MU3

The new roms keep rolling in

A SET of roms designed to enhance the use of Solidisk's 128k and 256k boards has been launched by Computer and Technical Services (0525 210706).

SideAid 128 and SideAid 256 have been designed to give both non-programmers and programmers full control of Solidisk shadow, ramdisk, roms and sideways ram.

A disc front-end menu is also included together with an easy-to-use MCOPY facility allowing multiple files to be re-named and copied from one or more drives.

Both packages come complete with manual and cost £19.

* * *

AN upgrade to the Pineapple PCB drafting program is now available, along with a second rom which gives full automatic track routing capabilities.

Features include a file of component shapes, movement of shapes on screen, expansion or reduction of finished circuits. Printouts may be either 1:1 or 2:1 positives or negatives.

Pineapple (01-599 1476) says that the autorouting option, which comes on a separate 16k rom, will work on a standard unexpanded BBC Micro. Price £85 for the PCB program and £110 for the autorouting rom.

* * *

A SOPHISTICATED extension rom for View and Viewsheet spreadsheet called **Doubleview has been announced** by Tubelink (01-205 9393).

With Doubleview it is possible to work on two documents at the same time, and a cut-and-paste clipboard facility allows transfer of text from one document to another.

Other features include pop-up menus for View, ADFS commands, on-screen help information, and continual display of free memory, current file and printer driver names.

ARCHIMEDES SOFTWARE SALES ARE SOARING

IF software sales are any indication of a machine's popularity, the Archimedes has arrived.

One software producer who sees a particularly bright future for the Archimedes is Clares, and the company is already devoting much of its time and energy to developing products for the machine.

Managing director Dave Clare is particularly pleased with the success of Artisan and Graphics Writer, and of the Toolkit Module – "The Archimedes seems to be especially popular with programmers," he says.

"Education is set to explode later in the year", he says, citing a welter of queries from educationalists – and not only in the UK.

Art departments in particular are seeing the Archimedes as the affordable graphics tool, especially with **its dual Integrex and dot** matrix colour printer support, but other departments too are adding the machine to their ranks of BBC Micros.

And if the rumour of the **DES replacing existing BBC** Micros in schools with Archimedes proves true, more software houses are going to be catering for the machine.

Archimedes software is already attracting a "quite astonishing response" from overseas, with buyers from as far afield as New Zealand and **the States, says Dave Clave.**

In fact there has been "a lot of positive feedback", and Clares (0606 48511) has responded with Alpha-Base, priced at under £50 – the Archimedes equivalent of the BBC Micro's Beta-Base.

Fast and flexible – it's capable of sorting 50,000 records in little over a minute – Alpha-Base incorporates many users' suggestions and features often lacking in more expensive databases, though it is not programmable.

Clares' latest release, a utilities disc to complement Artisan, offers the facility to read the colour palette and adjust printed output for faithful reproduction – or even to adjust the on-screen colours before printing and to check the results by outputting a test strip.

THE continuing success story of Superior Software has led to another top-level appointment. Ralph Pearce (on the left with, MD, Richard Hanson) has joined the company as marketing executive, after a year in which Superior doubled its annual turnover – and held the number one spot in the BBC software charts for 51 weeks.

LEARNING BUSINESS

THREE business simulation packages for sixth form students, designed to form a graded trilogy in business dynamics, have been released by RBRC.

The first – Beat The Boss – is an introduction to the Fothergale business series. It acts as a learning-by-doing program in which making mistakes forms a critical part of the learning process.

With the Cement Business Game the user has to run a fictitious company solving technical and techno-economic problems.

The final package – Crisis Management – is the most sophisticated of the three. It involves running a company for five years.

RBRC (01-946 8641) says Crisis Management is an upgraded version of Beat The Boss but with additional decisions and a more delicate balance between resources and finance. Price £130.

Arcana lines up 3D title

SOFTWARE house Arcana is gearing up to release titles for the Archimedes later in the year.

The most likely candidate for the company's debut on the machine is Crater Wars whose 3D solid-filled graphics can use the Archimedes' enormous processing power to the full.

Arcana (0272 297162) is also looking at the possibilities of producing a version of PowerPlay, aiming it the primary school educational market as a fun-to-learn package.

PowerPlay, popular on the BBC Micro, already offers four languages – French, German and Spanish as well as English – and the facility for teachers to add their own questions.

FIGHT WORLD WAR I AGAIN

WORLD War I is about to break out again on the BBC Micro with the latest release from Lothlorien.

Historians have ascribed to Gavrilo Princip the blame for the chain of events that set in motion the first conflict declared to have been worldwide.

In this new wargame scenario you have the opportunity to change the colour of the world map, but you will have to be a skilled tactician to make any real mark.

The game can be controlled from different levels – strategic or tactical. It is also possible to control the Central Powers – Germany, Austria/Hungary and Turkey – as well as the Entente Powers – Britain, France, Russia, Belgium and Serbia.

Armies are made up of infantry, machine gun nests and artillery, with support from fleets of battleships and cruisers.

If the game is to be played from the strategic level you have to make clear the overall trend of your campaign. The action then proceeds without any further intervention.

Lothlorien (01-439 0666) says the strategic option is ideal for new players who want to see the way that war gaming works. Price £12.95.

Watford takes on the Z88

Nazir Jessa: "Ideal add-on to the Acorn range"

LEADING Acorn dealer Watford Electronics has taken on board another make of computer.

However, the decision to retail Sir Clive Sinclair's Z88 laptop is not seen as a betrayal of the traditional BBC Micro base by Nazir Jessa, Watford's MD.

"The Z88 is the ideal add-on to the Acorn range of computers as it uses BBC Basic", he said. "It further advances the power and versatility of an already excellent machine".

Watford Electronics has been selling the BBC Micro since it first appeared six years ago and, until now, has consistently refused to retail any other machine.

Although Nazir Jessa takes a Z88 with him wherever he goes he freely admits that at first he did not like the machine: "When I first saw it I was not terribly impressed, but one of my staff asked me to try it out. As soon as I did I fell in love with it.

"Because it is compatible with my BBC Micro I can do work at home or wherever I am and then download files when I return to the office. It really is an excellent machine".

Archimedes section for Innovation '88

THE Micro User Innovation Award 1987 was the most dramatically successful computer-based competition ever organised in the UK.

More than 500 BBC Micro and Master users from all over the world competed for the prize of a £1,000 Archimedes, and the event aroused enormous interest in the national and regional media – not least because of the extremely high quality of the entries.

They came from people as diverse as senior lecturers and businessmen, medical consultants and helicopter pilots, engineers and schoolboys.

Now *The Micro User* has announced the Innovation Award 1988 – an even bigger and better competition than last year's. Instead of being restricted to BBC Micro and Master owners, this year there will be a special section for Archimedes users.

In announcing The Micro User Innovation Award 1988, managing editor Derek Meakin said: "Not only ourselves but the entire industry was amazed by the response in 1987.

"The number of entries was staggering, and they reached incredible heights of diversity and ingenuity.

"I'm sure this standard will be at least maintained – if not surpassed – in 1988".

Further information about The Micro User Innovation Award 1988, and how to enter, will be published in next month's issue of *The Micro User*.

The chip designers use BBC

STUDENTS on a two-year computer science course at Cambridge University are producing designs for computer chips with the help of 30 BBC Micros.

The computers are being used as low-cost graphics terminals linked to a mainframe running Qudos Quickchip software.

After just eight hours of lectures and eight two-hour practicals, students are able to design their first silicon chips. Working prototypes are then produced by Qudos within a single term.

Chip design has been voted the most popular course of the year by many computer science undergraduates.

Host of new products going to the show

THERE will be no shortage of things to do, see and buy during the Electron & BBC Micro User Show at UMIST, Manchester, March 18 to 20.

Many of the more than 70 exhibitors have already released details of the new products and bargain offers they are bringing along to the show.

Slogger is introducing Challenger ADFS which runs on the Challenger system from Opus. It normally retails at £34.50 but will be on special offer at the show.

Dabs Press is launching a printer driver rom called HyperDrive. It has NLQ printing, on screen printer effect, 80 star commands to control printer effects and costs £29.95.

Micronet has a new modem called ProPak which is priced £199.

AVP Computing is launching Pixel Perfect, a desktop publishing package the company claims is unique in having a 120-character true A4 width output and typefaces produced on a 48 x 48 grid.

Hybrid Technology will be showing its Music 2000 interface. This allows Midi-equipped instruments into the Hybrid Music System so that they can take their seat in the orchestra alongside the Music 5000. Simple selections send whole

Turn to Page 13 ▶

RISC USER THE ARCHIMEDES MAGAZINE AND SUPPORT GROUP

A BRAND NEW SUPPORT GROUP HAS BEEN LAUNCHED FOR THE ACORN ARCHIMEDES COMPUTER

RISC USER is written by an experienced team of Archimedes enthusiasts with roots in education, home computing, and over 5 years experience with the BBC Model B and Master computers with BEEBUG magazine. So popular is BEEBUG that membership exceeds 20,000 worldwide.

RISC USER provides lively and informed coverage of what's happening in the world of the Archimedes. Reviews, hints, programs and articles are specifically written for the Archimedes, showing how to exploit the many features of this sophisticated computer. RISC USER has material of direct use to education, business, industry and home computing.

RISC USER includes a well balanced selection of the latest news from Acorn and other major suppliers, pre-release reviews of the latest software and peripherals, as well as editorial features, ideas, hints and tips, readers letters and much more. RISC USER is published 10 times a year and is only available on subscription.

RISC USER subscription also gives you free access to our technical support team who may be contacted by phone or letter. This team of experts will endeavour to resolve any software or hardware problems that you may have, and will also provide unbiased advice. RISC USER is also an Acorn appointed Archimedes Support & Service Centre should you need repairs etc.

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NEWS

Graphics on video

A NEW podule for the Archimedes – Chromalock, from Wild Vision – is a genlock and full colour overlay system which allows the BBC Micro's graphics to be superimposed on to a video picture.

The package is already attracting considerable interest from professional and educational users, says Wild Vision (091 281 8481). Captions, titles, animation and so on can be overlaid on to the picture during editing, or superimposed in real time on to the signal from the camera.

Interactive video systems can also use the Chromalock, with a normal PAL composite video monitor, to display computer graphics over the pictures from a video disc.

A stable genlock circuit with fast response time enables Chromalock to lock on to any reasonably stable PAL/CCIR standard video signal, and it also encodes the micro's RGB output into a PAL signal, with wideband full fidelity colour encoding.

Chromalock is available for the Archimedes, Master 128 and Model B or B+ Micros.

Standard versions are priced at £265 for the Archimedes and £245 for other models while higher performance podules are £355 and £335 respectively.

Prices for the genlock only, and no overlay system, are £155 and £140.

FROM PAGE 10

parts or single voices to individual Midi instruments including a drum machine.

Information Education will be displaying the latest Viewbook stories and the Viewbook Oxford Children's Dictionary.

Meedmore Distribution will be demonstrating and selling the latest Nidd Valley Mouse software package Illustrator and Illustrator Paintbox. This graphics design suite is packed with powerful features for the production of high-resolution desktop graphics. Full-colour design is supported in any of the graphics modes 0,1,2,4,5. Meedmore is also showing 7 Art for Mode 7 mouse graphics design.

Zonefour has promised an amazing total of no fewer than 120 new peripherals from dust covers to computer service kits. The firm is offering its entire catalogue at trade prices during the show.

From PMS comes Genie Junior, a set of utilities comprising desk diary, notepad, address book and phone book, price £9.95.

There will be plenty of action on the Archimedes front too.

Characters up to 6in high are possible with Signwriter from Wight Scientific, priced under £80. The firm is also launching a BBC Micro utility – Label Writer, price £10 – and selling a full range of colour ribbons for £5.

Educational software house LCL is launching its first Archimedes packages. Micro English, Micro Maths and Micro French are GCSE courses and Mega Maths is an A Level course. Each contains 24 programs and comes with support literature and voice tapes. They are on offer at a special show price of £19, a saving of £5.

Apart from the wide choice of new products, there's a particularly magical atmosphere to this show.

That's due to the presence of the Spirit of Adventure group, a bunch of enthusiasts who meet to act out mediaeval quests.

They will be at UMIST disguised as wizards, goblins, minotaurs and zombies. Visitors will get the chance to play the hero or heroine in their adventure simulations.

This means the chance to battle against magical forces, dragons and other monsters and maybe win a prize in the treasure hunt.

All this plus the constant availability of some of Britain's top BBC Micro experts who will be on hand to answer your technical questions.

A money-saving advance ticket order form is on Page 6.

THE GALLUP CHART TOP 20 BBC SOFTWARE

THIS MONTH	LAST MONTH	TITLE (Software House)	TAPE PRICE
1	△ 5	LIFE OF REPTON *Superior*	6.95
2	▽ 1	PLAY IT AGAIN SAM *Superior*	9.95
3	△ 10	LEAGUE CHALLENGE *Atlantis*	2.99
4	▽ 3	GRAND PRIX CONSTRUCTION SET *Superior*	9.95
5	●	STAR WARS *Domark*	9.95
6	△ 7	SPITFIRE 40 *Mirrorsoft*	9.95
7	●	WINTER OLYMPIAD *Tynesoft*	9.95
8	▽ 4	SURVIVORS *Atlantis*	2.99
9	▽ 2	PALACE OF MAGIC *Superior*	9.95
10	●	SPELLBINDER *Superior*	9.95
11	●	COMPUTER HITS 4 *Beau Jolly*	9.95
12	▽ 6	CRAZEE RIDER *Superior*	9.95
13	●	BONECRUNCHER *Superior*	9.95
14	▽ 9	PAPERBOY *Elite*	9.95
15	●	FIVE STAR GAMES 3 *Beau Jolly*	9.95
16	●	SUPERIOR COLLECTION VOL 1 *Superior*	9.95
17	●	ELIXIR *Superior*	9.95
18	▽ 12	AROUND THE WORLD IN 40 SCREENS *Superior*	6.95
19	▽ 13	RANSACK *Audiogenic*	9.95
20	▽ 8	SPY VS SPY *Tynesoft*	9.95

Compiled by Gallup/Microscope

Life of Repton jumps ahead of Play it Again Sam this month, while eight new entries gives an indication of the number of titles available. Highest newcomer is Star Wars, of film and arcade fame – read the review in this issue of *The Micro User*.

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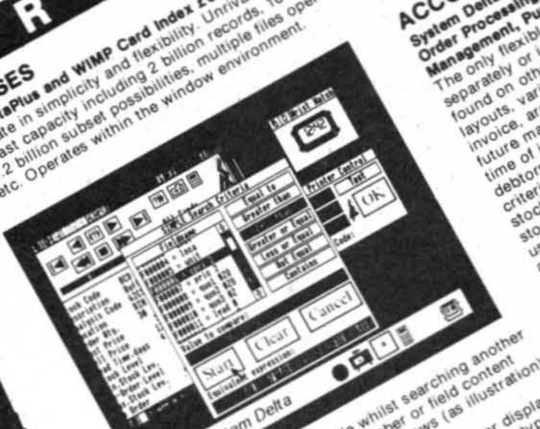
Individual programs designed to integrate; use separately or link together to form a powerful business system. Systems Delta, Gamma and Sigma . . . designed by highly acclaimed professional programmers with proven ability on the BBC, now providing definitive software for the Archimedes.

A R C H I M E D E S

DATABASES

System DeltaPlus and WIMP Card Index £69.95 The ultimate in simplicity and flexibility. Unrivalled in power. Vast capacity including 2 billion records, 16 million fields. 4.2 billion subset possibilities, multiple files open at once, etc. Operates within the window environment.



- Multi-tasking. Edit one file whilst searching another
- Instantly find records by number or field content
- Search by simple selection windows (as illustration) or multiple criteria complex searches
- Multiple user-definable formats for print or display
- Simple card creation with various data entry types
- Unrivalled, comprehensive maths, searches and sort
- Mailing labels with line compaction
- Comprehensive, yet simple reporter facility
- Card copier to transfer records across files
- Imports data from dBase, Lotus, Viewstore, etc.
- Includes relational programming language, if required

DeltaBase £29.95 *Affordable excellence*
Extremely powerful yet simple to use general database. Over 8000 records, 255 fields and 16 subsets. Pull down help screens. Various screen modes. Extensive single or multiple criteria searches, sorts and maths facilities. Restructuring records is easy. Imports data from Viewstore, Betabase, InterBase, Mini-Office, etc

ACCOUNTS

System Delta Business Accounts £69.95 each module Order Processing/Invoicing, Sales Ledger, Stock Management, Purchase Ledger, Nominal Ledger
The only flexible accounting suite. Use modules separately or integrate. Contains many features not found on other micros including definable invoice layouts, varied discount structures on one invoice, archive mail order customers for future mailshots, add new credit account at time of invoicing, selection of aged debtors/creditors or statements by various criteria, generates purchase orders, suggests stock levels, determines most profitable stock items, stock and sales graphs, numerous user-definable nominal accounts with unlimited bank accounts, output to a spreadsheet.

SPECIALIST APPLICATIONS

Flexible specialist software available for School Administrator, Video Rental, Newsagent, Hotelier (Genealogy, Timetabling coming early 1988)

GAMES

Minotaur Game £14.95
3D maze game. Fast reactions not needed. Create maze to your own size. Survive to rescue the men and kill the Minotaur.

Send for full brochure including other products

B B C M I C R O

System Delta with Card Index £64.95
Still the most comprehensive and flexible data management system on the BBC. 8160 records, 255 fields, 8000 characters per record. 8 subjects. Up to 5 files open at any time. Find any record in 3 seconds. Extensive single or multiple criteria searches, sorts and maths facilities. Multiple print formats. Default card. Card copier for transfer between files. Fully programmable relational system with over 150 commands available.

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Three versatile support programs for use with all System Delta files. Mailshot produces up to 4 across labels and links with wordprocessors for mail-merged documents. Reporter produces simple lists as well as fully definable reports including negative or positive columns, averages, totals, headings, sub and sub-sub-totals. Inter/View Link transfers data directly or as a result of any calculation including sum, average, count, etc.

System Delta Personal Accountant £45.95 each module (Nominal £55.95)
Five comprehensive accounting modules for use separately or as integrated suite. Many advanced features as listed above. Total flexibility allows customisation if required.
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The first Graphics Management System. Anyone can produce stunning graphics and charts easily from the menu driven GammaPlot supplied. Multiple charts on screen at any one time and in any position desired. On screen text editorial. Several fonts provided for variable text. Statistical analysis. Macro facility. Entry by keyboard or System Delta files. Fully programmable to create your own graphics programs.

School Administrator £69.95
Pupil and staff records allow extra fields to be added if desired. Entry reports for examination boards. Form 7 DES statistics, etc.

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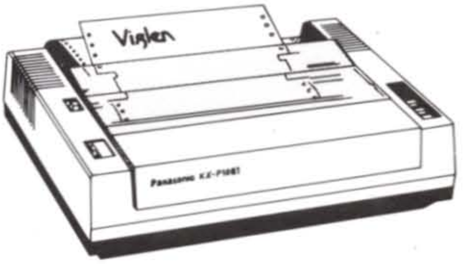


The Panasonic KX-P1081 come complete with £45.00 worth of accessories FREE including tractor feed and roll feed units with paper, printer cable, and a specially designed metal printer stand. Features include:

- ★ 120 cps draft printing 24 cps NLQ
- ★ IBM and Epson compatibility through dip switch settings
- ★ Prints 80 coloumns on A4 cut sheets, continuous stationery or roll paper 9 × 9 draft and 18 × 23 NLQ

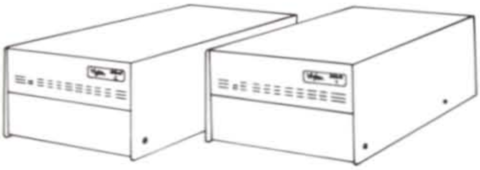
Stock Code	Description	Price inc. VAT
SP079	Panasonic KX-P1081 plus accessories	£185.95

Please add £8 for insured courier delivery.

WINCHESTER

MEGA BYTES FOR MINI BUCKS

NEW LOW PRICES



Plug in 20 to 112 Megabytes of extra storage with the Viglen Winchester system.

The Viglen Winchester is ready to plug in and use on a BBC Master micro; for a BBC B or B plus you will merely need to fit the Acorn ADFS Rom. The Winchesters are 100% compatible with the Acorn Winchester and Acorn ADFS and will also work with the Acorn Master 512 board with DOS plus.

Drive 1 Winchesters are also available for backup or just more storage and simply plug into the back of the Drive 0 unit.

The Winchester package consists of: Winchester unit (cased with controller boards, power supply and fan), Master reference Manual part 1, Winchester user guide and Winchester utilities on disk (such as formatter, verifier, ADFS menu and sophisticated backup program allowing you to make fast backups on DFS disks, ADFS disks or Drive 1 Winchester).

Stock Code	Description	Price inc. VAT
Drive 0 Single		
SP0150	VB20 20Meg Viglen Winchester	£499.00
SP0152	VB28 28Meg Viglen Winchester	£519.00
V155	VB40 40Meg Viglen Winchester	£799.00
V156	VB56 56Meg Viglen Winchester	£899.00
Drive 1 Second Drive		
SP0160	VB120 20Meg Drive 1 Winchester	£479.00
SP0162	VB128 28Meg Drive 1 Winchester	£499.00
V165	VB140 40Meg Drive 1 Winchester	£739.00
V167	VB156 56Meg Drive 1 Winchester	£769.00
V157	20MB Tape Streamer Backup	£689.00
V503	Acorn ADFS Rom and Manual (Only necessary for BBC B or B Plus)	£29.95

Please add £8 for insured courier delivery.

Available for use with SJ research file server at no extra cost, please specify when ordering.

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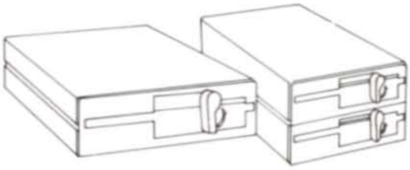
The finest Japanese disk drives (not Taiwanese immitations) available at the lowest prices.



All disc drives are supplied with a manual, packed utilities disc and a full 12 Months warranty (2 Year Warranty available) and are ready to plug in and use on a BBc B (fitted with a DFS) B + or Master micro. 40/48 Track drives have a switch which enables operation in either 40 or 80 track mode.

The capacity quoted are given in single density mode; for double density mode (1770 DFS + ADFS as in the Master) the capacities should be approximately doubled.

An integral power supply is not necessary as the disc drives run from the micro's power source however should you require drives with their own power supply, these are also available. If your BBC B micro does not have a DFS fitted then you will also require the Acorn dfs kit. These are available from Viglen.

Stock Code	Description	Price inc. VAT
SP014	400K Single Drive 40/80T	£99.95
SP030	400K Single Drive 40/80T + PSU	£109.95
SP019	800K Dual Drive 40/80T	£189.95
SP020	800K Dual Drive 40/80T + PSU	£209.95
VPD0240	100K Single Drive	£105.95
VPD0241	400K Single Drive 40/80T	£113.00
VPD0242	200K Dual Drive	£195.95
VPD0243	800K Dual Drive 40/80T	£219.00
VPD0245	100K Single Drive + PSU	£119.95
VPD0246	400K Single Drive + PSU	£135.00
VPD0247	200K Dual Drive + PSU	£209.95
VPD0248	800K Dual Drive 40/80T + PSU	£235.00
VPD0249	800K Dual Drive 40/80T + PSU in Metal Bridge Unit	£265.00
V0060	3.5" 400K Single Drive	£95.95
V0061	3.5" 800K Dual Drive	£199.95
V0062	3.5" 400K Single Drive + PSU	£135.00
V0063	3.5" 800K Dual Drive + PSU	£199.00
V0064	3.5" and 5.25" 800K Dual Drive	£219.00
V0065	3.5" and 5.25" 800K Dual Drive with PSU	£249.00

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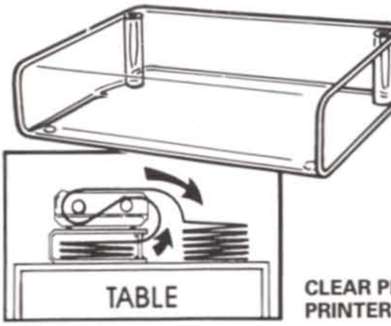


CLEAR PERSPEX PRINTER STAND

The Viglen printer stands are beautifully finished in clear perspex and raise the printer high enough to put continuous stationary underneath.

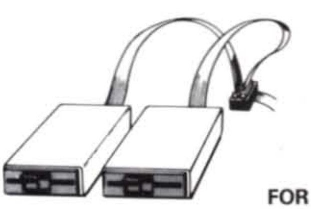
Stock Code	Description	Price inc. VAT
V490	80 Column Printer Stand (15" × 13" × 3.5")	£19.95
V491	136 Column Printer Stand (23.5" × 13" × 3.5")	£29.95

Please add £3 P & P

ORDER FORM ON LAST PAGE OF VIGLEN SECTION

SPECIAL OFFERS FROM VIGLEN

DUCKS



DUAL DRIVES FOR LESS THAN £17!

The Viglen Data DUCK (Dualling Up Connector Kit) converts any two single drives to a dual drive instantly. Simply plug the duck into the micro's disk drive socket and plug two single drives (any type and any make) into the duck to obtain a dual drive system accessed as drive 0 (and 2 if double sided) and drive 1 (and 3 if double sided). If neither single drive has its own power supply then you will require a Viglen power DUCK in order to obtain two disk drive power sockets from the micro.

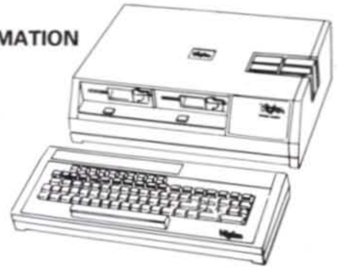
★ No soldering simply plugs in.
★ No need to take disk drives apart to change links.

Stock Code	Description	Price inc. VAT
V084	Viglen data duck	£16.95
V085	Viglen power duck	£7.95

Please add £2.50 for P & P.

CONSOLE SYSTEM

MASTER TRANSFORMATION



Give your BBC Master micro the professional PC look by replacing your existing lid with this smartly styled package. The system is strong and constructed in high impact ABS colour matched to the BBC Master and it gives your Master a very neat and impressive look.

★ Will support monitors including up to 16" TV.
★ Can house two 5¼" disk or Winchester drives.
★ Capable of housing 3½" drives.
★ Will accept Acorn cartridges and the Viglen Master Cartridge system.
★ Full internal metal screening.
★ Also available with fitted drives (5¼", 3½" or Winchester) or as a complete system including the Master.

The Master console unit system packages includes:

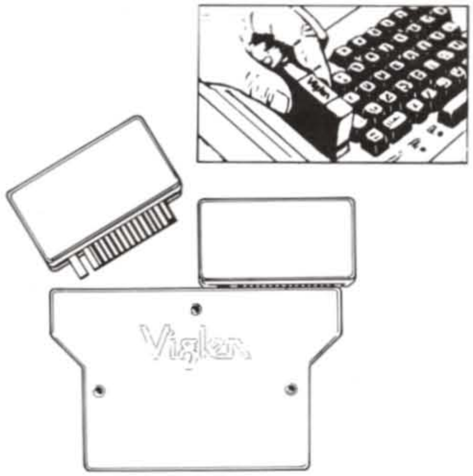
★ Remote Keyboard case with cable.
★ Metal screened main unit casing (including internal fittings for 5¼" drives).
★ Two switches which can be used for 40/80 track switching and can be either fitted on the front or rear of unit.
★ Two blanking plates to blank out any drive aperture that is not used.
★ Full labelling kit.
★ Fully illustrated fitting instructions.

Stock Code	Description	Price inc. VAT
V861	Viglen Master Console unit	£59.95
Accessories for the Master Console unit		
V853	Dual Drive data cable for console unit	£9.95
V854	Dual Drive power cable for console unit	£7.95
V855	Power supply for the console unit	£34.95
V866	Fan Kit for console unit	£34.95
V858	Fitting bracket for 3½" drive	£8.95
V851	Viglen Professional Console Unit for the BBC micro	£49.95
	Fitting service available from	£15.00

Please add £8 for insured courier delivery.

CARTRIDGE SYSTEM

VIGLEN ROM CARTRIDGE SYSTEM



Having fitted the Viglen Rom cartridge system to your BBC, Master or Master COMPACT, you can plug in your Roms/Eproms simply by inserting each one in a Viglen cartridge and plugging in whichever cartridge you want to use. The same Viglen cartridge can be used on all the micros mentioned and there is no need to switch the micro on and off between cartridge changes.

The Viglen cartridge system for the BBC micro consists of the cartridge cable assembly and socket, blanking off plates, 1 cartridge and cartridge storage rack. The cartridge socket when fitted protrudes from the rectangular slot on the left of the keyboard where the cartridges are subsequently inserted. It is simple to fit and requires no soldering.

The Viglen cartridge system for the Master and Master COMPACT simply plugs into your Master cartridge slot (or COMPACT expansion port) and accepts two Viglen cartridges. On the Master you can plug in up to two Viglen cartridge systems thus giving you access to 4 Viglen Cartridges simultaneously. The system comes complete with 2 cartridges and cartridge storage rack. On the Master you can also use Viglen cartridges which have 32 and 64K paged Roms inserted.

Stock Code	Description	Price inc. VAT
V560	Viglen Rom cartridge system for BBC	£12.95
V559	Viglen Rom cartridge system for BBC (low profile)	£12.95
V550	Viglen Rom cartridge system for Master	£14.95
V551	Viglen Rom cartridge system for COMPACT	£14.95
V561	Single Viglen cartridge	£3.45

Please add £2.50 P & P (£00.50 for single cartridge).

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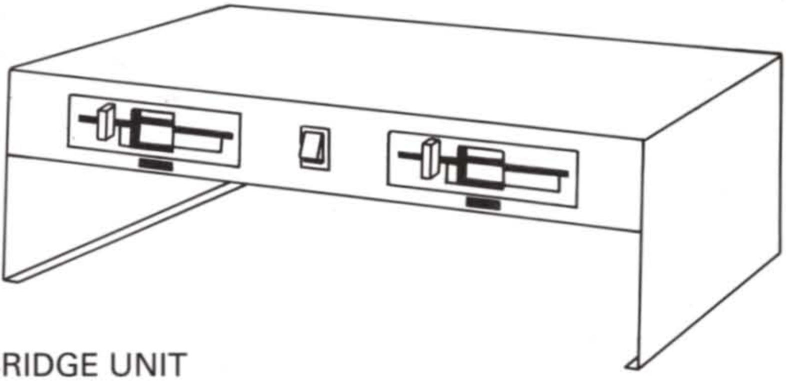
DISK DRIVES

- ★ FRONT PANEL SWITCHING
- ★ 800K DUAL DRIVES 40/80T WITH PSU

SPECIAL OFFER £229.95 Inc. VAT

Direct disk drives are manufactured to the highest standard using high quality Japanese mechanisms. All drives are supplied complete with user manual and utility diskette.

Stock Code	Description	R.R.P.
SP0249	800K Drive in Bridge Unit with PSU	£229.95



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Service has new specialist role

ONE of the country's leading learned societies has joined MicroLink.

The British Psychological Society has nearly 12,000 members and is involved with government, the health and education services, academic institutions and other organisations here and abroad.

Last year its charter was changed to allow it to maintain a register of chartered psychologists which the general public will soon be able to consult.

This gives the country a new breed of chartered specialists whose education and professional conduct the BPS oversees.

The society is no stranger to the benefits of electronic mail. For some time its members who work in academic institutions have been communicating via JANET, the Joint Academic Network.

By joining a more widely-used service like MicroLink, BPS members working in all areas of psychology can now communicate faster and more efficiently with the Society's offices in Leicester.

In addition the society's extensive business activities, which include publications and software, will be enhanced by MicroLink Email and telex facilities.

Modems move will cut comms costs

MICROLINK is to launch its own range of modems in a dramatic move to drastically reduce the cost of computer communications.

At the same time it says it wants to demystify the process of going online by including with each modem easy-to-use communications and word processing software specially tailored for a specific machine.

First MicroLink Communications Packs that have been announced are for the PC and BBC Micro.

The MicroLink dual-speed modem offers two operating speeds – 12/75 and 300 baud. Together with lead, communications and word processing software, it costs £99.

The top-of-the-range MicroLink multi-speed modem includes the faster 1200/1200 baud. It is fully Hayes-compatible and in addition offers many sophisticated functions such as auto-answer and auto-dial. Also with lead and software package, it costs £169.

A unique feature of both packs is that purchasers will be entitled to one month's unlimited use of Britain's most popular electronic mail service, Telecom Gold.

They will be given free registration on MicroLink/Telecom Gold, allocated their own Telecom Gold mailbox and be allowed one month's free connect time to the service.

"This is not just a demo mailbox as on Prestel, which is restricted to demonstrating what is available, but a personal, password-protected mailbox which can be used for sending and receiving messages via electronic mail and directly accessing a host of other services", said MicroLink head Derek Meakin.

"This is the first time free access has ever been offered to a public Email service. But we feel it is only right that newcomers to communications should be encouraged to freely explore this vast database at their leisure and find out for themselves all the exciting things it contains".

For BBC users, the software accompanying both modems is a special adaptation of the communications and word processing modules from the award-winning Mini Office II package.

"The intention is that you have everything you need in one pack", said Derek Meakin. "All part of our aim to simplify communications for everyone".

BUSINESS BULLETIN BOARD LAUNCHED

MICROLINK has joined forces with the University College of Swansea to provide a unique electronic bulletin board for businesses.

Subscribers can get advice free of charge from experts in various fields, and discuss business problems with others who may have experienced similar difficulties.

As well as being instant and free, this access to professional expertise comes with no strings attached, no axe to grind and no commercial bias.

The wide range of business sectors covered includes legal matters, exporting, industrial relations, management, market research, personnel and training, statistical and systems analysis.

Expertise is also supplied in the areas of computing and computer systems, electrical and electronic engineering, expert systems and artificial intelligence, and mechanical engineering.

Users of the Business Bulletin Board can browse through the messages and replies for items of interest, or leave a message themselves.

All messages are read by the system operators who pass them on to the relevant expert.

Archimedes

BEEBUG the recognised Archimedes specialists.

RISC USER

We have launched a magazine and support group specifically for users of Archimedes. The magazine provides news, reviews, hints and programs, while the support group gives Technical Advice and 5% discount on our range of Archimedes products. UK subscription is £12.50 per annum.

Reserve your Archimedes 400 Series computer NOW.

Archimedes 440s are available Ex-stock and 410s will be available in the first quarter of '88.

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BBC B issue 7 with DFS	£225
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Computers must obviously be in good working condition to qualify for this offer.

Please telephone for further details

PRICES INCLUDE VAT

Where two prices are shown, the first is our full price and the second our members price.

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0796C Serial Link Kit & Disc	18.16	17.25

See next column for details

MINERVA

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(Available End of December)

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(Available End of December)

This kit enables files to be transferred between BBC and Archimedes, in either direction, with the minimum of fuss. The software is menu driven and is fully compatible with DFS and ADFS. The three metre lead simply connects between the serial ports and the software is loaded via the Archimedes.

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1084B Logistix	113.85	108.16
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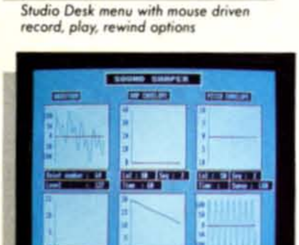
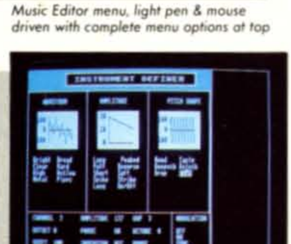
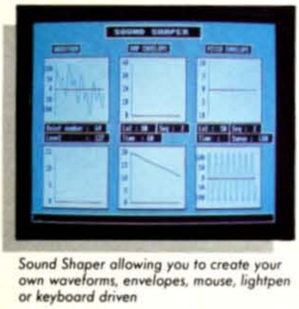


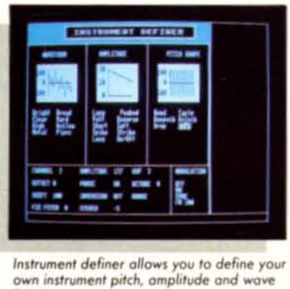
Studio Desk menu with mouse driven record, play, rewind options



Music Editor menu, light pen & mouse driven with complete menu options at top



Sound Shaper allowing you to create your own waveforms, envelopes, mouse, lightpen or keyboard driven



Instrument definer allows you to define your own instrument pitch, amplitude and wave forms

OVER 17000

visitors attended the 87 Acorn User Show. Most were amazed at the performance of the **MUSIC 87**. As a result we have been receiving hundreds of telephone calls from people wanting to know the differences and merits of the **MUSIC 87** synthesiser when compared to more expensive music synthesisers. Below is a table showing how the **MUSIC 87** compares to the Music 5000.*

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2nd processor compatible	×	✓
Light pen driven	×	✓
Full 32k EPROM	×	✓
Waveform designer as standard	×	✓
Ability to bypass AMPLE	×	✓
Graphic representation of waveforms, envelopes and score	×	✓
Music printout as standard	×	✓
Expensive	✓	×

Price Music 5000.* £161.00 (Incl. VAT) **MUSIC 87** **£79.95** (Excl. VAT)

MUSIC 87
SYNTHESISER

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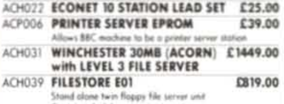
ECONET



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The Acorn Music 500

S Y N T H E S I S E R

Now available from **Peartree** the Acorn Music 500 for the BBC, BBC B+, Master 128

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**Please Note
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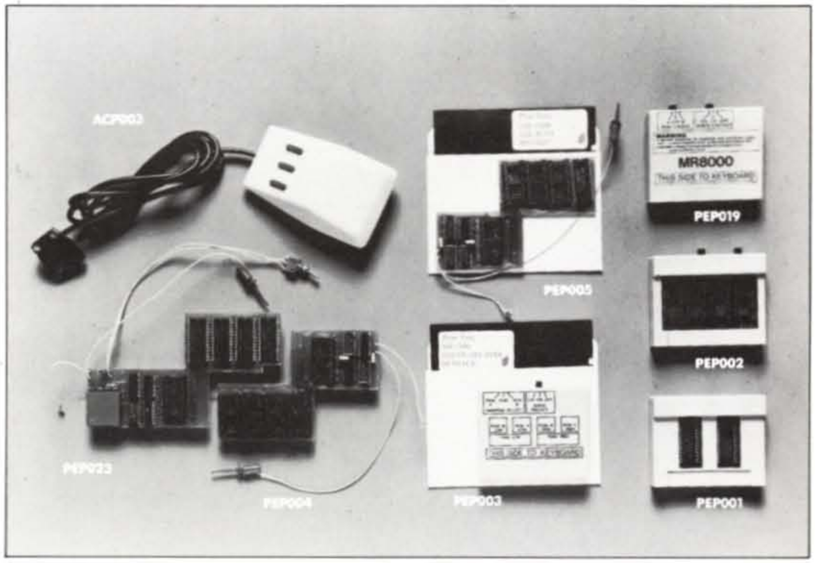

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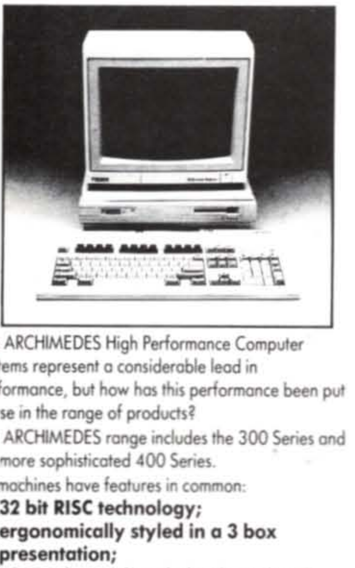

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Perhaps you wish you could add your own specialist commands – such as a facility to swap the contents of two variables.

Over the next three months we'll be looking at how to do just that. Although we'll be using machine code, don't worry if you're not too sure about it, as the example programs given are complete and require no knowledge of assembler to use them.

Having said that, I hope that these articles will help to give a clearer idea of machine code to those interested in learning it.

Let's kick off by finding out how to add the simple one character command B for BEEP. Not the most useful, perhaps, but it shows how things work. So, type in and run the following.

```
10 REM Example program
20 PRINT "Hello"
30 B
```

The computer was expecting a Basic keyword at the start of line 30 and as it didn't recognise the B it reported *Mistake at line 30*.

To create this error message the interpreter sent a number along with a string to the error handler, the address of which is stored in locations &202 and &203, the break vector.

So here's our first clue as to how we can add our own keywords. We must redirect the break vector to point to our own routine which will trap any errors that occur. If an error is not *Mistake* we return control back to Basic's error handler, and if it is *Mistake* we can go on and do some further checking.

Look at lines 200 to 440 in Program I to see how we do it. The machine code is assembled differently depending on which version of Basic your micro has and these lines test whether the correct version is present and if not the message at line 350 is printed.

If you are using Hi-Basic this check is not made for reasons I'll explain later.

Having ascertained that the correct version is present, lines 480 to 530 actually interrupt the break vector if that hasn't already been done. Lines 480 and 490 load the contents of the break vector – stored in &202 and &203 – into the A and X registers of the 6502.

Lines 500 to 530 check whether the vector has already been changed, and if so jump to *alreadychanged* which, having an RTS, returns to Basic.

However, if the vector hasn't already been changed, lines 570 and 580 store its contents in &70 and &71, and lines 590 to 620 reset the vector to point to *main* where we can check whether or not the error was *Mistake*.

As we are interrupting the Basic interpreter's execution, lines 700 to 740 save the contents of registers A, X and Y by pushing them on to the 6502's stack.

Now we are ready to test for *Mistake*, error number four. When Basic generates an error it leaves locations &FD and &FE pointing to a byte which contains the error number.

At lines 750 to 780 a check is made to see if this byte contains a four: If it does, the error must be *Mistake*, so a branch is made to *beep*.

Otherwise, lines 820 to 860 pull the stored contents of A, X and Y back off the stack and line 870 forces execution to jump to the location pointed at by &70 and &71, which you will remember is the actual location of the normal error handling routine we copied earlier from &202 and &203.

So far, so good. We have established that the error was number four, *Mistake*, and now need to discover whether it was generated by our new keyword, B.

The Basic interpreter uses a pointer called Pointer A, or *PTRA* for short, to tell it where in a program it is. This is located at &A, &B and &C.

Why three bytes? Well, &B and &C point to the start of the current Basic statement being executed and &A acts as an offset to the exact position within that statement.

When an error is encountered *PTRA* points to one character after the start of the error in the program. So lines 910 to 970 take the contents of *PTRA* and place it in locations &80 and &81. We are only using two bytes because we add the offset at &A to &B and &C and store the result.

Then lines 980 to 1040 subtract 1 from &80 and &81, and lines 1050 to 1070 test to see if the character pointed to is a B. If not, line 1170 jumps to *notbeep* which exits to Basic's error handling routine.

At last, at line 1090, we have found the new keyword B, so lines 1090 and 1100 execute the equivalent of VDU 7, a beep.

All that's left for us to do is to return execution to the Basic interpreter. This is done by lines 1140 to 1240.

Line 1140 calls a routine in the Basic rom which moves *PTRA* on to the next statement in the same line – if there is one, otherwise *PTRA* moves to the start of the next program line.

The three PLAs in lines 1150 to 1170 pull the contents of the A, X and Y registers off the stack because, as we are not going to the error handling routine, they are no longer needed.

The six PLAs following in lines 1180 to 1230 pull off unwanted error handling information that would have been passed to the error handler.

Finally, line 1240 jumps to a routine in the Basic rom which continues program execution from where it left off.

As it stands the program caters for five different Basics: I, II, Hi-Basic, Master and Compact.

To determine the Basic in your micro the program looks at location &8015 in the rom which contains an identification number. This means that if you are using Hi-Basic the program will not work correctly so you need to change the following lines – after you've corrected any typing mistakes using the checksums:

```
200 JMP vectors
1310 GOTO 1470
```

Also, if you assemble the program on the Compact and try to run it on another micro you will be told the utility is for Basic 6 only. Although this sounds strange it is simply because the identification number held in the rom is 6. I assume that's because Acorn was reserving 5 for the Archimedes Basic.

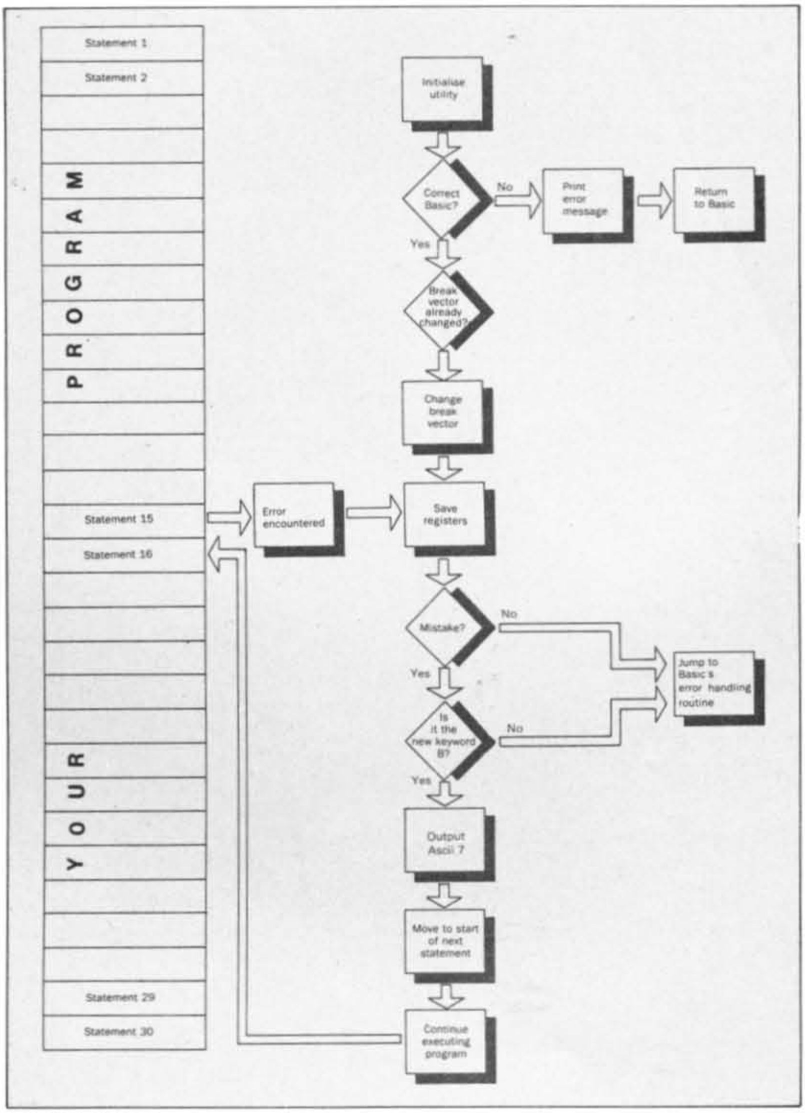
Talking about the Archimedes: If you are running the 6502 simulation mode and have a copy of Hi-Basic you will be able to use this program if you make the changes to lines 200 and 1310.

Now that you've got the framework for adding extra commands, try experimenting with your own one-letter keywords.

The Basic I, Basic II and Hi-Basic rom routine addresses were found in the excellent book Within the BBC Microcomputer by Roger Cullis, published by Losco, and I would like to thank him for providing me with addresses of the rom routines for Master and Compact Basic.

If you wish to delve further into the depths of your micro I can thoroughly recommend this book as a valuable source of information.

● *Next month we'll be looking at how to add more than one extra command and also how to make them as long as we want, rather than just single characters.*


Statement 1
Statement 2
PROGRAM
Statement 15
Statement 16
YOUR
Statement 29
Statement 30
Initialise utility
Correct Basic?
No
Print error message
Return to Basic
Yes
Break vector already changed?
Change break vector
Error encountered
Save registers
Mistake?
No
Yes
Jump to Basic's error handling routine
Is it the new keyword B?
No
Yes
Output Ascii 7
Move to start of next statement
Continue executing program

Flowchart of beep

Program I

```
 10 REM **********************
 20 REM *                    *
 30 REM *        BEEP        *
 40 REM *                    *
 50 REM *   By Robin Nixon   *
 60 REM *                    *
 70 REM * (c) The Micro User *
 80 REM *                    *
 90 REM **********************
100 REM
110 MODE 7
120 PROCinit
130 FOR PASS=0 TO 3 STEP 3
140 P%=&C00
150 [
160 OPT PASS
170 \
180 .start
190 \
200 LDA basic
210 CMP &8015
220 BEQ vectors
230 LDX #0
240 \
250 .errloop
260 \
270 LDA errmess,X
280 BEQ enderr
290 JSR oswrch
300 INX
310 JMP errloop
320 \
330 .errmess
340 \
350 OPT FNequs(CHR$13+CHR$10+"This uti
lity is for Basic"+CHR$32)
360 \
370 .basic
380 \
390 OPT FNequb(B%+48)
400 OPT FNequs(CHR$32+"only!"+CHR$10+C
HR$13+CHR$0)
410 \
420 .enderr
430 \
440 RTS
450 \
460 .vectors
470 \
480 LDA &202
490 LDX &203
500 CMP #main MOD &100
510 BNE changebrkvector
520 CPX #main DIV &100
530 BEQ alreadychanged
540 \
550 .changebrkvector
560 \
570 STA &70
580 STX &71
```

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◀ From Page 26

```
 590 LDA #main MOD &100
 600 STA &202
 610 LDA #main DIV &100
 620 STA &203
 630 \
 640 .alreadychanged
 650 \
 660 RTS
 670 \
 680 .main
 690 \
 700 PHA
 710 TYA
 720 PHA
 730 TXA
 740 PHA
 750 LDY #0
 760 LDA (&FD),Y
 770 CMP #4
 780 BEQ beep
 790 \
 800 .notbeep
 810 \
 820 PLA
 830 TAX
 840 PLA
 850 TAY
 860 PLA
 870 JMP (&70)
 880 \
 890 .beep
 900 \
 910 LDA &A
 920 CLC
 930 ADC &B
 940 STA &80
 950 LDA &C
 960 ADC #0
 970 STA &81
 980 SEC
 990 LDA &80
1000 SBC #1
1010 STA &80
1020 LDA &81
1030 SBC #0
1040 STA &81
1050 LDY #0
1060 LDA (&80),Y
1070 CMP #ASC"B"
1080 BNE notbeep
1090 LDA #7
1100 JSR oswrch
1110 \
1120 .cont
1130 \
1140 JSR checkend
1150 PLA
1160 PLA
1170 PLA
1180 PLA
1190 PLA
1200 PLA
1210 PLA
1220 PLA
1230 PLA
1240 JMP continue
1250 ]
 1260 NEXT
 1270 CALL &C00
 1280 END
 1290 DEFPROCinit
 1300 oswrch=&FFEE
 1310 B%=(?&8015)-48:IF B%<1 OR B%>6 GOT
O 1650 ELSE ON B% GOTO 1350,1410,1470,15
30,1650,1590
 1320 REM
 1330 REM ** Basic 1
 1340 REM
 1350 checkend=&9810
 1360 continue=&8B0C
 1370 ENDPROC
 1380 REM
 1390 REM ** Basic 2
 1400 REM
 1410 checkend=&9857
 1420 continue=&8B9B
 1430 ENDPROC
 1440 REM
 1450 REM ** Basic 3 (Hi Basic)
 1460 REM
 1470 checkend=&D07C
 1480 continue=&C398
 1490 ENDPROC
 1500 REM
 1510 REM ** Basic 4 (Master)
 1520 REM
 1530 checkend=&9BA6
 1540 continue=&9005
 1550 ENDPROC
 1560 REM
 1570 REM ** Basic "6" (Compact)
 1580 REM
 1590 checkend=&9BA6
 1600 continue=&8998
 1610 ENDPROC
 1620 REM
 1630 REM ** Not a known Basic
 1640 REM
 1650 CLS:PRINT"This Micro is not runnin
g a compatible  Basic":END
 1660 DEF FNequb(byte)
 1670 ?P%=byte
 1680 P%=P%+1
 1690 =PASS
 1700 DEF FNequs(string$)
 1710 $P%=string$
 1720 P%=P%+LENstring$
 1730 =PASS
```

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```
  10 =    0 0
  20 =    0 0
  30 =    0 0
  40 =    0 0
  50 =    0 0
  60 =    0 0
  70 =    0 0
  80 =    0 0
  90 =    0 0
 100 =    0 0
 110 = 1092 2
 120 = DEBB 6
 130 = 7A36 4
 140 = D6E6 B
 150 = EB9E 1
 160 = D5D8 8
 170 =    0 8
 180 = 3208 0
 190 =    0 0
 200 = 5DE7 4
 210 = F45A 6
 220 = 1922 E
 230 = EA45 4
 240 =    0 4
 250 = 7C24 F
 260 =    0 F
 270 = 9EB4 A
 280 = 7FFF A
 290 = 9224 B
 300 = 7602 0
 310 = 52DB A
 320 =    0 A
 330 = BB2C A
 340 =    0 A
 350 = 29F8 5
 360 =    0 5
 370 = ABBD D
 380 =    0 D
 390 = 5226 A
 400 = 9A59 F
 410 =    0 F
 420 = 4545 9
 430 =    0 9
 440 = 9843 1
 450 =    0 1
 460 = 343B 6
 470 =    0 6
 480 = 74DF 8
 490 = 3698 3
 500 = 9253 E
 510 = 54D2 E
 520 = AEF9 C
 530 = F559 F
 540 =    0 F
 550 = C9FD 1
 560 =    0 1
 570 = 5660 E
 580 = EA67 3
 590 = DF66 9
 600 = A7D2 4
 610 = 5426 D
 620 = B7F3 B
 630 =    0 B
 640 = 23C3 5
 650 =    0 5
 660 = 9843 A
 670 =    0 A
 680 = 37C9 3
 690 =    0 3
 700 = 824E 8
 710 = 6ECC D
 720 = 824E 5
 730 = 5DFD 4
 740 = 824E C
 750 = 9CF1 F
 760 =  A93 9
 770 = 427D C
 780 = AED4 3
 790 =    0 3
 800 = 2419 7
 810 =    0 7
 820 = 4E8A 6
 830 = 670E 5
 840 = 4E8A 1
 850 = 772F F
 860 = 4E8A E
 870 = 25CF B
```

```
 880 =    0 B
 890 = 8975 9
 900 =    0 9
 910 = 93D6 2
 920 = 74FB 4
 930 =   9E 0
 940 = 465E A
 950 = B394 2
 960 = A1BE D
 970 = 567F 0
 980 = 8D00 0
 990 = E148 0
1000 = EDDE E
1010 = 465E 9
1020 = F169 E
1030 = FDFF 8
1040 = 567F 1
1050 = 9CF1 B
1060 = 5039 C
1070 = FB4A B
1080 = 3D95 2
1090 = 7272 C
1100 = 9224 3
1110 =    0 3
1120 = A47E D
1130 =    0 D
1140 = 8BD6 A
1150 = 4E8A 3
1160 = 4E8A 0
1170 = 4E8A 3
1180 = 4E8A 1
1190 = 4E8A 0
1200 = 4E8A 1
1210 = 4E8A C
1220 = 4E8A 6
1230 = 4E8A 4
1240 = 3842 C
1250 = 8B58 7
1260 = 2C83 D
1270 = 460D 0
1280 = FD2E 0
1290 = 344C 5
1300 =   78 4
1310 = 5438 0
1320 =    0 0
1330 =    0 0
1340 =    0 0
1350 = 25B9 B
1360 = 10F5 9
1370 = ED0F 7
1380 =    0 7
1390 =    0 7
1400 =    0 7
1410 = 999A D
1420 = BA4C 9
1430 = ED0F 0
1440 =    0 0
1450 =    0 0
1460 =    0 0
1470 = 13B9 E
1480 = D6C3 A
1490 = ED0F 7
1500 =    0 7
1510 =    0 7
1520 =    0 7
1530 = 52EF 0
1540 = CE78 0
1550 = ED0F 0
1560 =    0 0
1570 =    0 0
1580 =    0 0
1590 = 52EF 2
1600 = 4D68 E
1610 = ED0F D
1620 =    0 D
1630 =    0 D
1640 =    0 D
1650 = CC8A 8
1660 = DDF8 F
1670 = 24A9 C
1680 = 5569 A
1690 = 4348 6
1700 = 8EFA B
1710 = 4776 2
1720 = C06A E
1730 = 4348 A
```

Laser print technology

Bruce Smith looks into a new breed of printer

IF I had a pound for every time I'd been asked a question about printers – which one to buy, how to work out control codes, how to send the codes – I'd have earned quite a few bob.

The fact is that printers are important to anyone who is using a BBC Micro, increasingly so as the micro evolves from a programmer's delight into a serious tool running a wide range of practical applications for the home, school and business. Whether your requirements involve word processing, spreadsheets or databases – all need some form of printed output at the end of the day.

Technology does not stand still and there's no such thing as perfection. New products, or at least enhancements, will continue to hit the streets, and this was never more true than for the humble printer. Over the past 18 months we have been hit with about 50 different models, all offering slightly more than their predecessors.

However, the one thing that all of these have had in common is the base technology – they have virtually all been dot-matrix printers. In many cases the number of dots used to form the character to be printed has been increased from 9-pin to 24-pin, but with a corresponding increase in damage to the wallet.

But now you can forget about dot-matrix printers because the printer of the future is with us, using technology that you would expect to read about in an Isaac Asimov classic – the laser.

Silent quality

For the uninitiated, a laser printer looks very much like a small photocopier and the technology is similar – using a complex imaging system driven by a small on-board computer. And the end result is high-quality printed output with virtually no noise.

The first laser printers appeared over a decade ago with Canon doing the early research and development. Today the company's laser printing mechanisms – referred to as engines – are regarded by many as the industry standard, though Ricoh and more recently Kyocera have released their own cheaper versions.

From the operator's point of view there are a number of fundamental changes: For example there is no sprocket system to take your computer listing paper: Laser printers accept only single sheets, which are inserted into a paper tray slotted into the side of the printer, just like a photocopier.

And there is no printer ribbon: Powdered ink – called toner – held in a cartridge is used in its place.

Neither is paper fed in one end and directly out of the other with text and graphics being printed on to it as it passes through: Laser printers print a page at a time, the paper remaining inside the case until the page has been printed on to it. For this reason laser printers are often referred to as page printers.

As already mentioned, laser printers are quiet – I can still listen to the radio as I print – and they are also fast. The speed of a printer is normally measured in characters per second (cps). Laser printers, being page printers, have their speeds measured in pages per minute (ppm): The cheapest can work at 6ppm, though 8ppm is quite common.

Costs are higher

Running a laser printer is generally about three times more expensive than running a standard dot-matrix printer, taking consumables such as paper and toner into account. Toner is supplied in cartridge form and small units suitable for 1500 copies cost £30, a figure which rises to £100 for 4000 pages of average use. It is possible – although not easy – to get the cartridge refilled for about half the cost of a new one.

Another cost is servicing. A laser engine does not have an infinite life, and usually requires major servicing at about 100,000 pages. The quoted life of a laser engine is between 300,000 and 500,000 pages, though this can normally be extended quite significantly with regular cleaning and servicing. But even rated at 300,000 pages it's likely to last for many years.

The final output from the laser printer is of a very high quality, in fact so high that pages are often used as final artwork from which books are produced: The American version of Douglas Adams' Dirk Gently's Holistic Detective Agency and View: A Dabhand Guide are typical examples. It is also very likely that your local newspaper is produced in this way.

The measure of quality is a subjective one, but it is directly related to the printer's resolution, a value measured in the number of dots it can print in a line one inch long – dpi for short. The standard resolution for laser printers is 300dpi, although newer and more expensive breeds are now offering 600dpi.

The resolution of a standard 9-pin dot-matrix printer has normally been defined as a quantitative term expressed as single, double or quad density. In dpi these values fall out at roughly 60, 120 and 240 dpi respectively, while the 24-pin device can offer 360dpi. The last figure is somewhat higher than the 300dpi of the laser – but the quality is still inferior.

Why? The answer is two-fold: The dots used to construct the 24-pin output are much coarser than the fine toner particles used in a laser printer and, being a mechanical printing mechanism, the print head and ribbon degrade with every

Turn to Page 28 ►

```
%!
%% Reverse Printing
%% for PostScript laser printer
%% Bruce Smith and Paul Martin
%% Micro User

clippath pathbox
/ty exch 36 sub def
/ty exch 36 sub def
/by exch 36 add def
/bx exch 36 add def
newpath
bx by moveto
bx ty lineto
tx ty lineto
tx by lineto
closepath

gsave .99 setgray fill
grestore
5 setlinewidth
1 setlinejoin
stroke

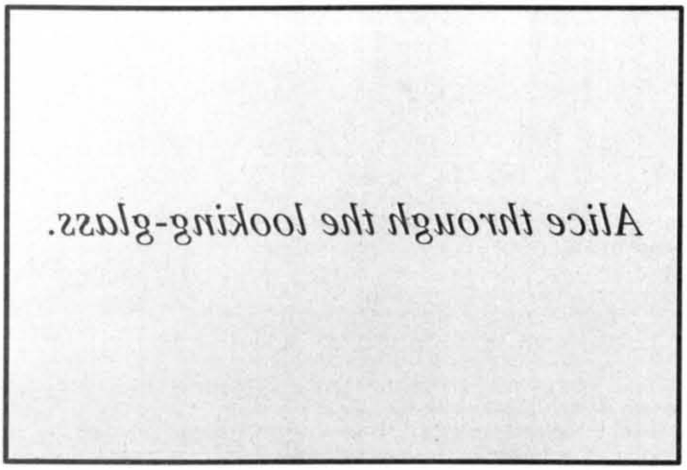
/str (Alice through the looking
glass.) def
newpath
/Times-Italic findfont
[0 50 50 0 0 0] makefont setfont
bx tx add str stringwidth
pop sub 2 div
by ty add str stringwidth
exch pop sub 2 div
moveto
str show

showpage

%% All done!
```

Figure I: A typical PostScript program

◀ *From Page 27*



Alice through the looking-glass.

Figure II: The PostScript program result

pass of the print head.

Another big plus in favour of the laser is that the range of fonts – typefaces – available is significantly increased. A basic set of fonts is built into each printer and is available the moment you switch on. However, most laser printers will allow you to add more, either by using a downloadable font, where the font is stored on disc and loaded into the printers on-board ram via the computer – a facility available on many dot-matrix printers – or by plugging a font cartridge into a special port in the printer.

All laser printers are fitted with a micro which contains ram, and the amount of memory is very important as it determines the complexity of the page that can be printed and the speed. Like all printers the quoted speeds are always for best-case situations. In reality they are often much slower – complex pages take longer to print as there is considerably more work for the printer to do.

Page printers work by storing a bit image of the page for printing in memory. A standard A4 page of text/graphics occupies about 90 square inches of paper, which at 300dpi will need nearly a megabyte of ram.

Most laser printers have at least 512k of ram fitted – excellent for text only, but cumbersome when large quantities of graphics are used. The ideal figure is 1.5Mb, though this can be expensive.

The standard by which all printers are measured is the Epson FX80 – if a printer can act as though it were an FX80 it is said to be Epson-compatible, and most laser printers are.

However, the Epson standard is just one of many that exist in the business world and almost all laser printers can emulate other standards. Typical emulation modes include Hewlett Packard LaserJet Plus, IBM and Diablo 630. However, only a limited number can offer a Page Description Language – PDL – as their driving force.

Laser printers can be classified under two broad headings – intelligent and dumb. Most traditional printers fall into the latter category as the printer must be told to output each individual dot or character on the page. This is done by the computer sending a special code which is recognised and translated into dots which are in turn printed on paper. When a laser printer is operating in an emulation mode it is acting in this way.

The more expensive "intelligent" laser printer supports a PDL. When instructed, the associated software does not send an image of the page to the printer, but rather sends a description of the page in the form of a PDL program. This is decoded by the laser printer's on-board computer, which then turns the page description to toner on the paper.

Page description languages are very sophisticated and must be capable of describing all aspects of composition. They will accept commands for font selection, highlighting, font size and orientation, and all the usual graphics commands. They also offer the programmer a new and rewarding challenge from which some quite amazing results can be obtained in the form of printed output.

However, the most important aspect of a page description language, and the reason why it is so very important, is that it is resolution independent. No matter what the resolution of the printing device being used the PDL will use it to full potential – without loss of clarity. There are several PDLs available, but the *de facto* standard is called PostScript.

But you can't use a language like this unless the software you are using supports it. For several years Acorn has had a special program called PPS which is a PostScript printer driver for View. This understands a number of new View stored commands which can be used to select all the different laser printer effects. The program is not generally available and is unlikely to be – so don't phone Acorn about it.

However, as a PostScript program is nothing more than an Ascii file, it can be written using a word processor and sent directly to the laser printer. Figure I shows a typical PostScript program and Figure II the final printed result.

All this technology doesn't come cheap and for a basic laser printer you can expect to pay at least £1500 and up to £6000 for a good PostScript device. But that said, I can remember the days of the £500 single 40-track disc drive and £400 dot-matrix. This time next year you can expect the prices of today's laser printers to be about the same. Ignore them at your own peril.

How a laser printer works

A laser printer does not work by burning an image on to a sheet of paper, but it does contain a real laser. Like any similar device it emits a small amount of radiation, and so the casing it is housed in has to conform to very strict BS standards.

When a page is sent to the printer it is sent in the form of a bit image, just like a screen display in Mode 0 where 0s and 1s are used to represent black and white.

Once in the printer's ram the on-board computer sets the internal mechanics into action. First a light-sensitive drum begins to rotate and has a negative charge placed across it. The laser beam is then strobed very rapidly across the width of the drum firing a burst of light at each point where part of the image will fall. Extreme accuracy is called for here – the drum loses its negative charge where the beam hits.

As the drum turns it comes into contact with the negatively charged toner. Basic physics states that like poles repel, so the toner does not stick to the negatively charged areas – only those which have no charge following the passage of the laser. The net effect is that toner adheres to where the laser has been.

The paper has at this stage been given a positive charge as it passes through the printer, so the negative toner particles held on the drum are attracted to it. The charge only lasts for a short while, so the toner is bonded on to the paper by passing it through heated rollers and ultimately into your hands.

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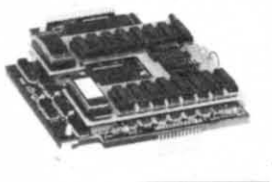

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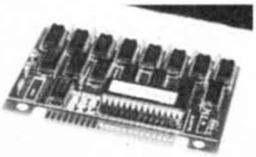

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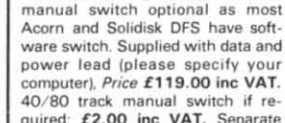

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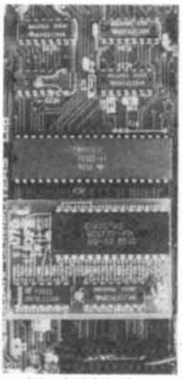
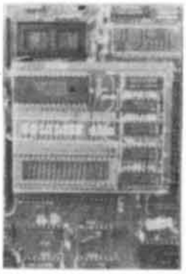
DFDC with 2.2 and 2.1 set (3 ROMs)	**£63.00 inc.**

Data sheet available on request.



WD-1770 DFS



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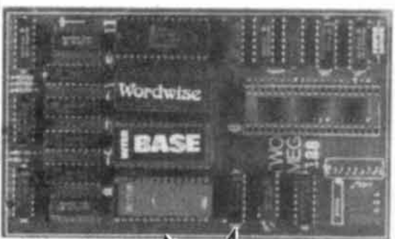

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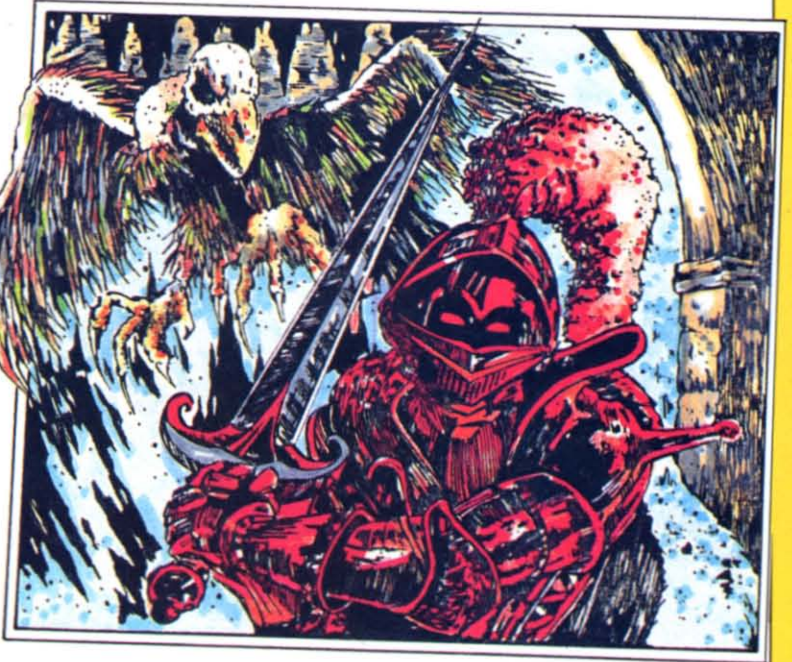
SOFTWARE SCENE

Skirmish ... battling buzzards

Price: £9.95 (cassette), £11.95 (5¼" disc), £14.95 (Master Compact disc)
Supplier: Godax, 12, Chiltern Enterprise Centre, Theale, Berkshire RG7 4AA.
Tel: 0734 302600



IMAGINE a world in which you sit atop a giant blue ostrich and engage in medieval-style jousting contests with opponents riding giant green buzzards. This is the setting for Joust, Atari's smash arcade hit.

It sets itself apart from most other games by taking the idea of a two-player game one stage further – you play not only against another human opponent, but also against a number of computer opponents. Thus half a dozen combatants can be on the screen at once, each doing his/her/its own thing. This multi-player/multi-baddie idea has since been expanded to produce the staggeringly successful Gauntlet.

Now we have Skirmish, a superb conversion of this arcade favourite. I first heard of the game over a year ago, and the finished product proves to be very well worth the wait.

From the outset, it sets out to impress. The cassette loader features a remarkably good idea that until now I had only seen on Gary Partis's games. The screen actually shows you – via a countdown timer – how long you must wait for the rest of the game to load.

Another Partis-like feature is that you are presented with a full set of scrolling instructions while the main game code is loading – clever.

Once the game has loaded, three Jet-Pac-style landing stages are displayed, and you are invited to start the game.

Upon doing so, I found that the player sprites look rather messy, because of the crammed-in detail. Aside from this minor point, Skirmish faithfully recreates all the addictive qualities of the arcade original.

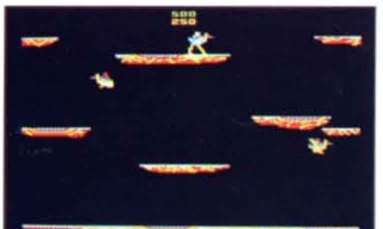
The controls are simple: Left, right and flap. The last control causes your bird to flap its wings once. Press it repeatedly to hover, and faster still to gain height. Being able to hover and manoeuvre well is the key to the game.

Skirmish features three different types of computer-controlled rider: The Bounders, wearing red armour, are fairly easy to defeat. The Hunters are more cunning, and the Shadow Lords are virtually impossible to dismount. The early stages feature only red Knights – cannon-fodder to an expert, but more than difficult for the novice.

To win a joust, you must fly into any opposing player, making sure that your lance is higher than his. If you are successful, you will be rewarded with a satisfying *THWACK* sound.

A vanquished human opponent simply loses a life and reappears somewhere else on the screen. However, a computer opponent falls off his mount and turns into an egg, while his riderless buzzard flies off into the distance.

You must grab this egg within a certain time period, or it will hatch, spawning a rider of the next grade. His buzzard will then reappear: If it gets to him before you do, he's back in play with a vengeance.



If your opponent's lance is higher than yours, you will die and your bird will fly mournfully away. You soon learn to fly to the top of the screen as quickly as possible, but even this commanding position is by no means safe.

The buzzard riders have a nasty habit of ganging up on one player – it's great to play the hero and swoop down from the skies to rescue your teammate from their clutches.

When all the computer-controlled riders have been defeated, the next wave begins. Later stages add even more nasties – the Lava Troll that stalks along the bottom of the screen ready to grab any foolhardy contestant who comes too close, and the indestructible Pterodactyl that flies backwards and forwards until the wave has ended. The Pterodactyl can appear on earlier waves if you take too long to defeat your opponents – give it lots of air-space.

Skirmish provides all the useful features that make all the difference to any good game: Pause/restart, sound on/off and quit game are all included. Keyboard and joystick are supported in both one-and two-player modes.

Joystick control is almost essential for the two-player option, but Skirmish takes this feature one stage further. Press the fire button on joystick 1 for a one-player game and that on joystick 2 for a two-player bash. No sooner has one game ended than another can begin – an invaluable feature for a game this compulsive.

I can recommend Skirmish wholeheartedly. It is one of the most playable games I have ever seen and will certainly lead to a severe case of repeated late nights. To quote the loading commentary: Prepare to joust, buzzard bait.

Hac-Man

Sound	*8*
Graphics	*7*
Playability	*11*
Value for money	*9*
Overall	*9*

Black Queen ... play better Bridge

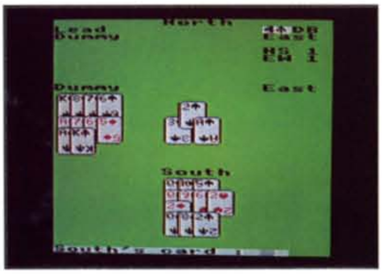
Price: £14.95 (disc)
Supplier: BBC Soft, PO Box 234, London SE1 3TH.
Tel: 01-576 0584

BBC SOFT'S White Knight is one of the finest chess programs available for the BBC range of computers. The company has now released Black Queen, a contract bridge program – but does it maintain the high standard set by White Knight?

It is described as being suitable for both beginners and club players. As someone who hasn't played bridge since his sixth form days I was most grateful for the well laid out and informative manual supplied with the game.

Unlike the majority of programs these days, this one openly encourages you to make a working copy of the unprotected software. This is most advisable as you save the hand, and accompanying bid, on the actual program disc before play commences.

As in the real game, you must first deal the cards before bidding can begin. The deal can be a fresh one – shuffling and dealing a new pack of cards – or you may choose to reload a previous deal that has been stored on disc. In either case bidding continues until there have been three consecutive passes. At this stage you can save the deal and bid to disc, or select the play option from the main menu.



Play commences with the cards being set out in traditional N,S,E and W fashion. Two hands are visible – your own and the dummy hand. If you were the declarer of the bid then you play both the North (dummy) and South hands, otherwise you play the South hand only. The cards are large, well designed, and laid out in an easy-to-read fashion.

As play proceeds, the bid, the number of tricks won, and the last card led are displayed on the screen at all times. Following the thirteenth trick, a detailed breakdown of the current score is shown along with a sub-menu of five options.

If you are satisfied with the way that the game went, you can update the total score. If you found that you underbid the hand quite badly, you may choose to rebid and play it again.

You could have made a mistake that resulted in your losing several subsequent tricks – in this case you can choose to play the hand again. Option four lets you peek at all four hands before making a decision, and the fifth option returns you to the main menu.

This very flexible approach reinforces the educational aspect of the package – a player may replay the same hand many times with increasingly adventurous bids.

The final feature of Black Queen is a facility that allows the construction of deals – manually putting together four hands from the 52 cards available. This may be used for tackling bridge problems found in newspapers and magazines, or as a way of weighting one or more hands with specific cards.

Black Queen is a first-rate bridge program and most definitely a worthy stablemate for BBC Soft's White Knight chess.

Steve Brook

Sound	***N/A***
Graphics	***8***
Playability	***9***
Value for money	***8***
Overall	***9***

Bonecruncher ... skeleton soap opera

Price: £9.95 (cassette), £11.95 (disc)
Supplier: Superior Software, Regent House, Skinner Lan
Leeds LS7 1AX.
Tel: 0532 459453

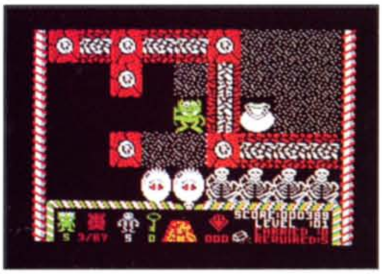
IN Bonecruncher you play the unlikely part of Bono, a little green dragon who lives in a castle by the sea. As an enterprising dragon, you have set up Bono's Bathing Company making skeleton soap, a commodity much prized by the giant monsters who bathe in the moat.

As every good business-dragon knows, real skeleton soap is made only from real skeletons: To keep the customers happy you must collect all the skeletons littered around the castle and boil them in your cauldron. This turns them into the luxurious soap, and voilà, another satisfied customer.

However, the castle is anything but a safe place. There are a number of trapdoors through which you could disappear without trace. Another unnerving fact is that some of the skeletons are not skeletons yet – they're very alive, very deadly monsters with an insatiable appetite for you.

A further hazard appears in the shape of giant spiders that rush around the walls biting any hapless dragons in their paths. The spiders will also eat any bones they may find: On some levels you must race the spiders to collect the skeletons. The castle is also inhabited by Glooks – large white creatures who love the smell of soap.

When you have climbed up a stairway to supply another customer with a bar of soap, the Glooks will – after a short delay – all move in the direction faced by this stairway. Although a Glook is not in itself harmful, it will crush you if you get in its way when it's moving.



An added problem is that you may find yourself, or the way forward, blocked by Glooks if you are unfortunate enough to take a bar of soap up the wrong stairway. However, you can push a Glook – or take advantage of the direction in which it is trying to move – so as to suffocate monsters and turn them into skeletons.

Fortunately, Bono's Bathing Company is not a one-man show. Your partner Fozzy is the brawn of the operation and is strong enough to hold monsters and spiders at bay. However, he is not very bright, and you must always keep an eye on him to make sure that he is not trapped or wandering round in circles.

Bonecruncher is very similar in appearance to Superior's classic Repton, with smooth four-directional scrolling and often fiendish puzzles. If you want to you can see it almost as an exact copy of Repton – diamonds are replaced by skeletons, spirits by spiders, skulls become trapdoors and so on.

On anything but a superficial level, however, the two games are quite different. The addition of Fozzy and the Glooks brings an entirely new dimension – for example, movement of the Glooks causes the layout of each chamber to change repeatedly around you.

The humour in Bonecruncher is probably the game's most appealing aspect. The skeletons grin at you and tap their feet expectantly and, if you stand still for more than a few seconds, Bono will start to yawn and stamp his foot impatiently. The monsters are also beautifully animated, jumping up and down showing a mouthful of teeth.

Bonecruncher will delight game players of all ages: Another sure-fire hit.

Hac-Man

Sound	***8***
Graphics	***9***
Playability	***9***
Value for money	***9***
Overall	***9***

Star Wars ... may the Force be with you

Price: £9.95 (cassette) £12.95 (disc)
Supplier: Domark, 204 Worple Road, London SW20 8PN.
Tel: 01-947 5622

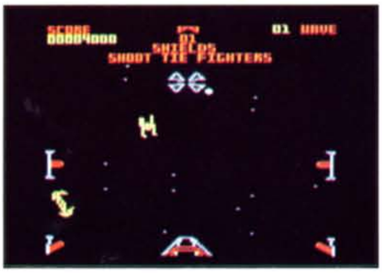
SEVERAL years ago Atari released a coin-op arcade game based on that most famous of space adventure films – Star Wars. Employing fast moving vector graphics it was an instant success and Domark has now released a version for the BBC Micro.

As in the original the action is divided into three scenarios: Dogfight in space, through the towers, and down the trench. These three scenes are repeated with increasing difficulty as you proceed through the game.

Scene one is based on Luke's dogfight in space en route to the Death Star. The Empire's Tie-fighters zoom in at high speed, launch laser bolts, then veer away. Using the four direction keys you steer the fighter's gunsights over the laser bolt and fire.

The same tactics work with the fighters too, but the bolts must be your main priority. Each hit you sustain destroys one of your shields – you begin the game with six. Lose every shield and the next hit will destroy your one and only fighter.

If you survive the dogfight you are transported down to the surface of the Death Star – except on level one: Here you begin a strafing run through a forest of laser firing defence towers. I found this to be the easiest of the three scenes. By swinging your sights slowly left and right while pressing the fire button you can destroy all towers and laser bolts in your path without sustaining a single hit.



The third and final scene is set in the trench. To destroy the Death Star you must travel its full length and accurately blast the exhaust port at the far end. Success is rewarded with a devastatingly mediocre explosion scene – the Death Star explodes outwards as an expanding series of multi-coloured concentric circles – yawn.

On level one the only hazards in the trench are laser bolts – you can avoid every single one of these by flying high and left, only venturing down into the trench at the very end to zap the exhaust port. Unfortunately these tactics do not work on the higher levels where the trench is criss-crossed by stretch barriers – these must be flown over or under. Oh yes, I almost forgot the missile emplacements you've got to shoot – while still ducking and dodging the stretch barriers.

Those of you who have already mastered the Force may find level one to be too easy a starting point: It is for this reason that Domark has included the option to begin on levels three or five – not recommended for beginners.

Fast moving vector graphics are employed throughout: These are fairly simple but effective. My only complaint is with the controls – which are restricted to keyboard only – a strange choice considering the sights move both horizontally and vertically. Joystick control would have been greatly appreciated.

Once you've mastered the keyboard controls you will soon begin to enjoy this very acceptable version of the arcade original.

Nev Astly

Sound	***6***
Graphics	***8***
Playability	***7***
Value for money	***8***
Overall	***8***

Word Puzzles ... a word in your eye

Price: £10 each or £32 (for the four) mail order only
Supplier: Able-Soft, 76 Warwick Park, Tunbridge Wells, Kent TN2 5EF.

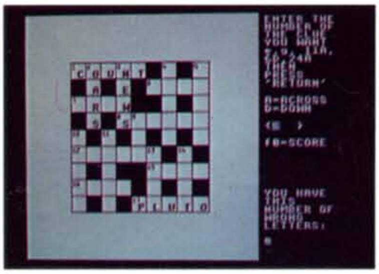
REGULAR purchasers of puzzle magazines may be interested in the suite of programs that has just been released by Able-Soft. Word Puzzles is a collection of four programs, each sold separately, and each representing a popular type of word test.

These are all disc-based and fully menu driven – the menu options are consistent throughout the suite, so there's no confusion when switching between games. Each is essentially a puzzle editor, and comes complete with up to 24 ready-to-solve challenges.

Crossword requires no explanation. The puzzles are based around a 13 x 13 grid drawn in medium resolution black and white, and annotated with small, but perfectly legible, clue numbers.

Clues are called up individually by typing the appropriate clue number and a cursor is then positioned on the crossword in preparation for your response. The puzzle accepts any answer, correct or incorrect. The only clue to your degree of success is provided by pressing f0 which informs you how many of the letters already entered are wrong.

A printout option is included in the menu – this prints the crossword either with or without answers. What puzzles me is why it doesn't print the clues – you could then use it as a crossword generator for friends and colleagues.



Crossgram – an anagram word game

Cross-fit is the second type of word puzzle – based on a crossword grid. Your task is to correctly position the answers on the grid, without the aid of clues.

The answers are grouped together as words of the same length. A group is displayed by pressing the number corresponding to the length of word required. Unfortunately the window used to display the list of words is only seven characters wide – words of eight or nine letters in length are therefore truncated.

There is only one correct solution for the puzzle, so an occasional press of f0 is advisable – just to keep a check on your progress.

Cross Reference is also based on a crossword design, but this time you're provided with neither clues nor answers.

Each blank square in the grid contains a number in the range of 1 to 26, with each of these numbers representing a letter. To help you get started you are provided with the first three letters, and it is then up to you to determine which letters are represented by the remaining numbers.

This type of puzzle works quite well on paper, but the computer version can easily degenerate into a *type it in and see if it fits* exercise.

The final program in the suite is **Crossgram** – an anagram based word game. It is played in the same way as Crossword, but with a smaller grid and anagrams as clues. I found this and the original Crossword to be the best of the four programs.

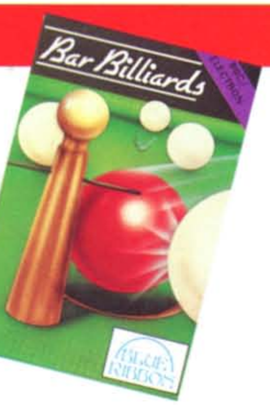
Word Puzzles is an interesting collection of routines that have a limited lifespan. Once you've completed the examples you are essentially limited to writing puzzles for other people.

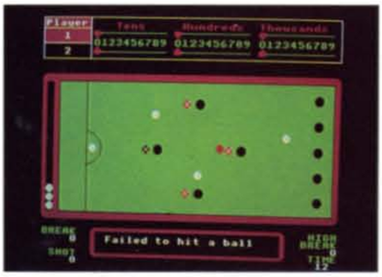
Carol Barrow

Sound	***N/A***
Graphics	***8***
Playability	***6***
Value for money	***7***
Overall	***8***

Three from Blue Ribbon ... cheap and cheerful

Products: Bar Billiards, Return of R2 and Video Card Arcade
Price: each £1.99
Supplier: Blue Ribbon, CDS House, Beckett Road, Doncaster DN2 4AD
Tel: 0302 21134





IT'S good to see continued support for Acorn Computers from budget-priced software houses. Blue Ribbon has another collection of games of luck, skill and strategy on offer.

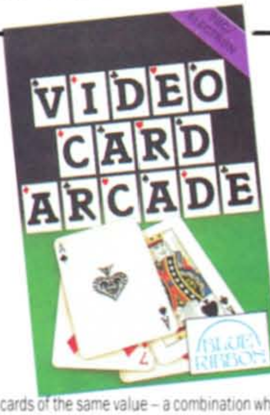
Bar Billiards is a re-release of an old favourite of mine. The game is a simulation of the classic pub game for one or two players and is ideally suited to the computer, being simple in rules and without too much fast movement.

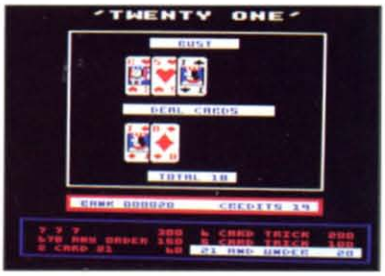
The basic aim is to pot balls down holes in a table, without knocking over the pegs which stand precariously in front of the higher scoring holes. You place a ball somewhere in a small D shape at one end of the table and cue it against other balls. It doesn't matter which ones go down – all score points, with the red ball always worth double.

Your break ends if you fail to pot a ball, but knocking over a white peg loses any score made in that break. Knocking down the black peg loses your entire score – the ultimate disaster. To avoid this, you can vary the strength of your shot and can also use top spin, back spin or a normal shot.

The only problem I encountered was a tendency for the ball to follow a curved path. Perhaps Blue Ribbon should level its table. That apart, this is a worthy simulation and well worth adding to your collection.

Sound	7
Graphics	5
Playability	7
Value for money	8
Overall	7





Video Card Arcade gives you a chance to play three different gambling style card games – all on your own and with no risk of financial ruin.

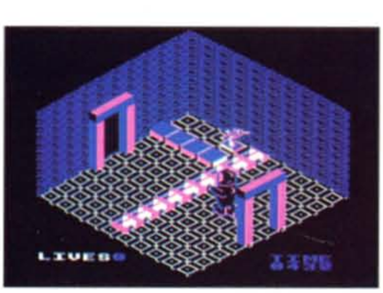
The first is Poker Royal. You are dealt five cards and have the option of discarding any number of them and having that number redealt. Your hand is then valued against a score table. Most of the time you will score zero, but occasionally you may get three cards the same and score a few points. Each hand costs you one credit point – you start with 20 of these, so you get 20 hands. I was bored with this game before using up my 20 credits.

Next comes Twenty One. This is a version of pontoon which is played against the computer, with a scoring system which means you can get more points for a five card trick or a pontoon. Twenty One is quite playable, but more fun if you use a pack of cards and a human opponent.

The third part of this trilogy is High/Low. This is based on a popular TV game and you must guess whether the next card turned will be higher or lower than the previous one. Again, there is a points system, with lots of points awarded if you get four cards of the same value – a combination which is not actually possible.

In the TV game, contestants are playing for points – and points, of course, make prizes. There is very little fun in this version, with a silly scoring system and no prizes. In fact, I can't really imagine who would want Video Card Arcade.

Sound	4
Graphics	7
Playability	2
Value for money	3
Overall	3



Return of R2 falls into the arcade adventure category. Your task is to steer a robot – R2 – around the planet Zelger to collect the boxes of Z42 compound. Three of these must be taken to the power room of Zelger to keep up the energy supplies. This task has to be completed within the time limit which is said to be 20 minutes.

Ranged against you are large numbers of radio-active barriers, laser bolt guns, a weird fire-breathing Buddha – or is it a dragon? and planks which suddenly fly at you. Your only controls are left, right, up and down.

The animation is quite good, being based on the technique called filmation. Each room is shown in 3D with a number of exits which look rather like a part of Stonehenge.

When you start playing you seem limited to a fairly small number of screens. A box can be seen in the corner of one, but it is totally protected by barriers.

After a period of frustration, you may wonder why the wall in one room seems to have a slight defect in its make up, but that little hole in the wall holds the key to getting any further.

Master that trick and you can wander along many a mile of similar passageways, avoiding laser bolts and barriers, and eventually finding all three boxes. The 20 minute limit does not seem to apply, but it gives you some idea of the time you are likely to have to spend to actually complete all the tasks. Of course, it will take longer to learn what you have to do.

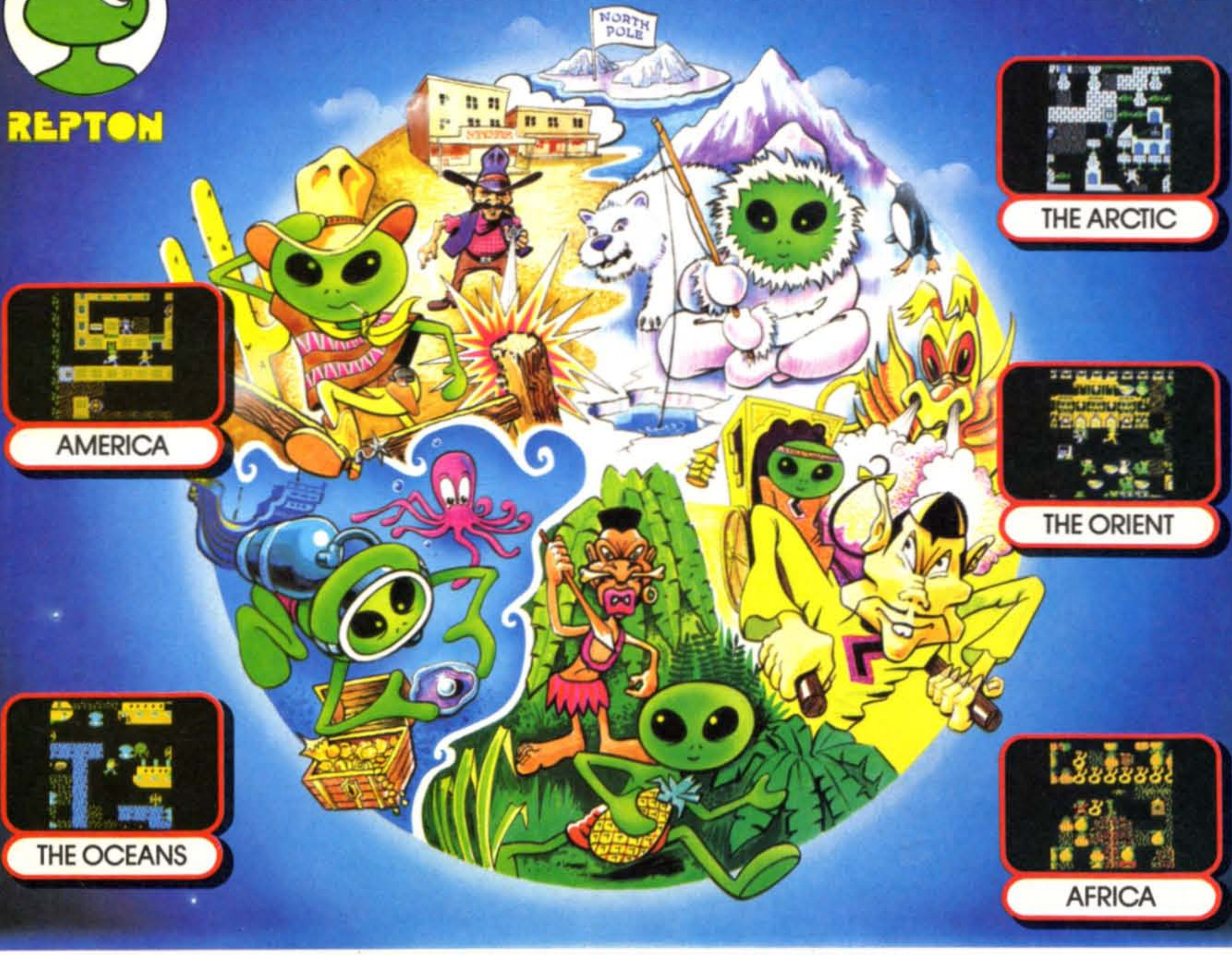
R2 is not a game to rave over – and it will not be a classic – but represents fair value at the price. It will probably mean no more than one evening's worth of work/enjoyment to people used to this type of program.

Rog Frost

Sound	7
Graphics	4
Playability	5
Value for money	6
Overall	6

Around the World in 40 Screens

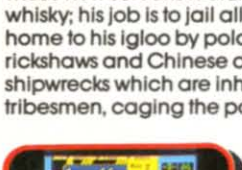
REPTON



Repton Returns . . . to Conquer the World

After the success of Repton 3, we were overwhelmed with requests for us to publish another set of screens for the game. We have now produced 40 new screens which, although enticingly amusing, are even trickier to complete than the original 24 screens of Repton 3.

These new screens feature Repton voyaging around the world. In America, Repton is a sheriff with a penchant for hamburgers and whisky; his job is to jail all the bandits and avenge the Red Indians. The Arctic sees Repton as an eskimo being "hotly" pursued home to his igloo by polar bears and penguins. Across to the Orient, and Repton is a kung-fu master amongst the pagodas, rickshaws and Chinese dragons. Repton becomes a deep-sea diver in the Oceans; he searches for pearls around the rotting shipwrecks which are inhabited by dangerous octopuses and squids. Finally, in Africa, Repton reaps his rewards by defeating the tribesmen, caging the parrots, and collecting the apples, bananas and pineapples — whilst watching out for falling coconuts!

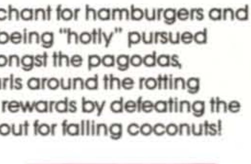


Each copy of Around The World in 40 Screens includes:

- the Repton 3 main program,
- the Repton 3 editor, and
- the 40 new game screens.

BBC Micro Cassette £6.95
BBC Micro 5¼" Disc........................£7.95
BBC Master Compact 3½" Disc.....£9.95
Acorn Electron Cassette..£6.95

(Compatible with the BBC B, B+ and Master Series computers).
The screen pictures show the BBC Micro version of the game.



PRIZE COMPETITION

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Teri Paul reports on the wonderful world of Magic and Mystery

The living Spirit of Adventure

IN an upstairs room of a large detached house in central Manchester sit a BBC Micro, a Master and an Archimedes – right next to a pile of swords, shields and spell books.

And what ties the highest of hi-tech to the world of mystery and mysticism? The business known as Spirit of Adventure.

For the company, renowned for its high-quality live fantasy adventure games, relies heavily on its computer equipment for the day-to-day running of its lo-tech quests.

"It was an obvious step for us", said Steve Turnbull, one of the four directors. "I've been working with BBC Micros for years and when we needed to produce instant quality print they were there"

Spirit of Adventure was conceived just two years ago out of an idea to bring the computer world of adventure games to life.

"It's such a simple concept, we wondered why nobody had thought of it before. After all, while it would be nice to have a castle, caves or dungeons, you don't actually need them – most fantasy stories occur out in the open, travelling from place to place. We've brought the whole genre alive".

The history of fantasy adventure games goes back 15 years. They evolved initially from table top wargames. Then someone had the bright idea of reducing the conflict of whole armies down to a single combat level. This developed into the notion of small groups of individuals working together to achieve a goal – their quest. With the addition of rules to govern the use of magic, the fantasy role-playing game was born.

Since then many different sets of rules have been published, covering all aspects of heroic fantasy – swords and sorcery, science fiction, superheroes, gothic horror, 1930s adventure stories – even modern day spies.

And from this wealth of material live fantasy role-playing was born. "The idea of live role-playing wasn't new, but providing an adventure setting exclusively outdoors was – and it's turned out to be very popular", said Steve Turnbull.

Live role-playing involves each participant creating a fantasy persona which he plays during the adventure. There are several basic character types, including warrior, wizard, warlock and scout, and various racial types, such as humans, elves and dwarves.

Each player takes his character

UMIST as it's never been seen before – and where visitors to the next Electron & BBC Micro User Show will be able to take part in a real-life adventure through a number of three-hour adventures, and as long as the character survives the trials of dragons, demons and lesser beings, he can gradually build up his strength and power.

"The great advantage of our system of rules", said Steve Gibson, another of the directors, "is that from the basic types each player can create exactly the sort of character he wants. If he wants to be Conan he can start as a warrior and increase his strength and weapon skills. Or to be Gandalf he would start as a wizard and build up in the fire-magic spells".

But how do the three BBC Micros fit in this mass of mayhem and magic?

"Administration is our greatest problem, and that's where the micros come in", said director Pam Turnbull. "We have so many members that keeping track of their addresses, membership status and so on by a manual system would be a nightmare, especially when it comes to writing out addresses on envelopes for the monthly Chronicles newsletter.

"Instead we have an easy-to-use, custom-written database which loads into the Master's sideways ram. With it we can access the members by name, address or even date of joining – plus we can print out labels, lists of names and phone numbers. It's not perfect, but it works".

Then there's the Chronicles themselves, which for the first year were actually set using the BBC Micro. Steve Turnbull again: "We originally used Interword with its column printing facility to produce the galleys, and then did the layout by hand.

"We've now moved that on to another computer which does the layout as well, but with new software becoming available for the Archimedes I can see us returning to a BBC-badged micro".

When you want to take part in a Spirit of Adventure quest the first thing to do is contact them by post or phone. Says director Shelley Gibson, "The one thing we haven't computerised yet is the bookings – the problem is getting the computer next to the phone – but we're working on it".

SAFE WEAPONS

The weapons used are composed of high-density closed-cell foam around a stiff central plastic strut. The foam is hand-carved to shape and covered in either fabric-enforced tape or coated in 15 layers of latex.

All the weapons must conform to a certain level of safety, and each is checked before an adventure begins.

Having arranged your booking you would be sent travel details and a map of the location where the adventure takes place.

"Unfortunately our locations are often way off the beaten track, so the maps are crucial. New members now get colour maps printed individually using Artisan on the Archimedes and the Integrex Colourjet printer – a very effective combination", said Shelley.

On the day of your adventure you arrive at the location where the Spirit of Adventure van is located and the tents set up.

The team have contemplated using Mike Cook's modification to run a BBC Micro from the van's 12v battery, but the idea has been shelved for the time being.

HAVE AN ADVENTURE

The Electron and Micro User Show in Manchester from March 18 to 20 will have a strong adventures theme, and visitors will have the chance to take part in a mini-quest run by the Spirit of Adventure team.

In addition you will be able to have your computer adventure game queries and problems solved at the Adventure Corner, and take part in the treasure hunt involving many of the exhibitors.

Newcomers are equipped with swords and costume, but regulars always supply their own. One spin-off company from Spirit of Adventure has been the Medlock Armoury which supplies weapons of all sorts, and Second Skin which provides realistic latex monster masks and other body ornaments – elf ears, beards, warty noses and so on.

A fully trained referee oversees the game, but generally does not interfere as you move from encounter to encounter across the countryside – sometimes fighting, sometimes talking, but always within the role of the character you have chosen.

The referee keeps track of how physically well-off your character is, how many points of magic have been spent in casting spells, and so on. Here again the BBC Micro is unobtrusively present.

Steve Gibson: "We are in the process of computerising the character records. Some programs have been written and tested, but for the time being we are still paper-based. The more complex areas are bound to be the last to go on line".

After your adventure there is a debrief where the referee assesses your performance as the character you chose and awards points. These are used to buy skills to enhance the power of your character, the total points earned by a character being used to assess his overall status.

Shelley Gibson: "Most characters have under 100 points, but one or two have reached over 180 – and that's very high".

The success of Spirit of Adventure has not been startling, but it has been steady – the company has recently acquired a building in Manchester where it runs indoor adventures in addition to the outdoor ones.

Steve Turnbull: "It's been a long grind, but we're now beginning to realise the dreams we had at the start, and we've been helped not least by the BBC Micro".

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Rory McCloy tries out the Acornsoft View integration package

Looking OverView

Product: OverView
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THERE was a heavy thud on my doormat as my review copy of OverView arrived. It is an impressive package with two slipcases packed full of the View family goodies listed in Table I, but what does OverView amount to?

If you have a Master 128, OverView will add the rest of the View family to the already resident View and ViewSheet. The only dud in the whole package is ViewPlot, which really lets the side down badly.

In addition to ViewSpell, ViewStore and ViewIndex you get the Acornsoft manuals for View and ViewSheet to supplement the rather simplistic chapters in the Master Welcome Guide. A rom cartridge comes fitted with two 16k eproms ready to slip into your machine. One simply contains ViewStore, version 1.2, while 8k of the other holds version 1.1 of ViewSpell.

The remaining space in this rom contains comprehensive HELP messages for the main View family packages, three new star commands and the Keeper – but more of this later. An ADFS format 5.25in disc contains the rest of the View family software and utilities shown in Table II.

Guides:
- OverView
- View
- ViewSheet
- ViewStore
- ViewSpell
- ViewIndex
- ViewPlot
- View family filing system
- Printer driver generator

Reference cards:
- ViewStore
- ViewSpell

Function key cards:
- ViewStore
- ViewPlot

Software:
- Rom cartridge
- Program disc

Table I: The contents of the OverView package

After sorting through the eight manuals, which could overwhelm a newcomer, I found that the slimmest – a mere 25 pages – was the OverView Guide. Essentially OverView enables you to switch between View, ViewSpell, ViewSheet and ViewStore without saving and loading files at each change of program.

This is achieved by the Keeper, which holds the individual files – called contexts – temporarily in ram. Suffixes to *KEEP determine whether you want to use discs – should all your ram be committed to other uses – and the directory in which the context files are stored.

If you are using ram, *KEEP OFF should be used to end the session and will save all those precious files on disc, under the context directory, before you switch off and lose everything.

If the files are not so precious you tell it to *KEEP QUIET and nothing is saved. The Keeper is fully compatible with the Turbo co-processor, but if this is active it is possible to create files that are too big to store as context files and a warning message appears.

- ViewIndex programs
- ViewPlot programs
- Printer Driver Generator programs
- ViewStore utility and example files
- ViewSpell dictionary files

Table II: Software on Utilities disc

I have to admit I have not yet found a real use for the Keeper. None of my applications for View family programs require me to have a wordprocessor, spellchecker, database and spreadsheet active – each with their own files – at the same time. I do not even use two applications together.

It is important to appreciate that OverView does not transfer data between programs, but merely stores the file while you work with another module. So, I was rather disappointed with the Keeper concept. The last three pages of the OverView Guide do contain a summary of the commands necessary to transfer data between applications, but these are not exclusive to OverView – with the exception of *READ.

OverView contains two new commands for ViewSheet: *READ and *RC. The former enables you to read a table of data from a text file into a spreadsheet. The text file could be created by View and the table entries separated by tabs. The *RC command will read the contents of one spreadsheet to another and complements the PC (Print Contents) command already in ViewSheet.

VIEW PROFESSIONAL

The OverView cartridge also provides a wide-screen utility so that *WIDE ON will provide a screen display of 106 or 53 characters, but I must say that the characters in the 106-width display are difficult to read even on a high resolution monitor and almost impossible on a standard resolution colour model.

Is the OverView package good value? If you have yet to acquire any of the View family programs for your Master, OverView is excellent value for money. But I already had ViewSpell, ViewStore, ViewPlot and ViewIndex so OverView had nothing significant to offer me.

It would perhaps be better to be able to buy just the 8k of rom utilities unique to OverView, without all the other major View family applications, and at a greatly reduced price.

What about it Acorn?

ViewSpell ADFS bug

Regular readers of *The Micro User* will remember the debate over the past year concerning the bug in ViewSpell version 1.0, which prevented ADFS users from creating a user dictionary. I am pleased to report that version 1.1 with OverView has had this problem solved. Furthermore, ViewSpell 1.1 is now compatible with the Watford DFS.

THE MICRO USER

PROGRAM Library No.13

Compiled by Steve Turnbull

THIS month's selection covers a wide range of subjects, from an anagram solver, through a string sort routine to a program to find the date Easter falls on in a given year.

Machine code programmers are aided with a label highlighting routine for screen listings, but it would be nice if someone could supply a version that operates in any screen mode – and when printing – and the string sort routine would be better implemented using either the shellsort or quicksort algorithms.

Send your routines – with full details of the language it is written in and the hardware/software requirements – on disc or tape to:

Steve Turnbull, Library, The Micro User, Adlington Park, Adlington, Macclesfield SK10 5NP.

Remember to enclose a stamped addressed envelope for the return of your media. Five blank discs will be sent to the authors of any routines published.

Title: Label Highlighting
Language: 6502
Author: Iain Coulthard

When scanning through a machine code program listing, a particular label can be quite difficult to spot, so some way of highlighting them would be a great help.

When running, the short machine code routine listed below intercepts the write character vector and switches the text colour to red after encountering a full stop – start of label – and switched back to white after a space or Return is printed. It works in Modes 1, 2 and 5, but Mode 1 provides the clearest display.

Type in and save the program. When you run it the machine code routine is saved and can be loaded with either:

```
*run hlight
```

or:

```
*hlight
```

The program also demonstrates by listing itself in Mode 1 so you can see the highlighting in action.

There is no check to see if the routine is already loaded, so running it twice will cause your micro to crash.

```
   10 REM Label Highlight
   20 REM by Iain Coulthard
   30 PROCinit:PROCassem
   40 PROCcli("S. Labels A00 "+STR$~P
%)
   50 CALLcode
   60 *key0"MODE6|MLIST|M"
   70 *FX138,0,128
   80 END
   90 DEF PROCinit
  100 code=&A00:wrchv=&20E
  110 oscli=&FFF7:osbyte=&FFF4
  120 oswrch=&FFEE:ENDPROC
  130 DEF PROCassem
  140 FOR L%=0 TO 2 STEP 2
  150 P%=code:[OPT L%
  160 .start
  170  LDA wrchv:STA oldwrchv+1
  180  LDA wrchv+1:STA oldwrchv+2
  190  LDA #mywrchv MOD256:STA wrchv
  200  LDA #mywrchv DIV256
  210  STA wrchv+1:RTS
  220 .mywrchv
  230  PHP:PHA:TXA:PHA:TYA:PHA
  240  LDA #218:LDX #0:LDY #&FF
  250  JSR osbyte:TXA:BNE exit
  260  TSX:LDA &103,X:LDX loff
  270  BEQ off:CMP #46:BNE exit
  280  LDA #17:JSR oswrch:LDA #1
  290  JSR oswrch:LDA #0:STA loff
  300 .exit PLA:TAY:PLA:TAX:PLA:PLP
  310 .oldwrchv JMP &FFFF
  320 .off CMP #13:BEQ skip
  330  CMP #32:BNE exit
  340 .skip LDA #17:JSR oswrch
  350  LDA #7:JSR oswrch
  360  STA loff:JMP exit
  370 .loff NOP:]:NEXT:ENDPROC
  380 DEF PROCcli($&700):LOCAL X%,Y%
  390 Y%=7:CALL oscli:ENDPROC
```

Get it right!

```
 10 =    0 0
 20 =    0 0
 30 = 597F F
 40 = 2A23 F
 50 = 74DE 9
 60 = AE79 7
 70 = 5DEC 2
 80 = FD2E D
 90 = 40D7 3
100 = 8752 7
110 = 37B9 B
120 = F8CE 5
130 = B623 0
140 = AAB9 9
150 = 7CBB 7
160 = 3208 1
170 = 1C19 0
180 = 67C5 D
190 = DE3A 0
200 = 8BE5 3
210 = 9A2F F
220 = 3AB1 4
230 = A5E9 A
240 = 5627 F
250 = E1B8 6
260 = C6AD 8
270 = F6F2 F
280 = 9791 4
290 =  F22 7
300 = 2124 2
310 = D64E 0
320 = 7DAB 2
330 = B466 F
340 = B76C 4
350 = 7574 8
360 = B739 8
370 = 3178 D
380 = E297 0
390 = 7002 C
```

Title: Alpha Sort
Language: Basic
Author: Peter Cumberland

This program is called Alpha Sort, and that is exactly what it does. The routine is designed to operate inside another program where an array of strings need to be sorted into alphabetical order.

The algorithm used is an improved bubble sort, where each array element is shifted into position, but once it is correctly positioned it is never checked again. While not the best technique available for sorting, it is quite satisfactory for most purposes.

```
   10 REM String Sort
   20 REM by Peter Cumberland
   30 MODE7:VDU23;8202;0;0;0;
   40 INPUT"How many items? "Items
   50 DIM Item$(Items)
   60 FOR I%=1 TO Items
   70 PRINT"Enter item ";I%;
   80 INPUT":"Item$(I%):NEXT
   90 Swap=FALSE
  100 FOR I%=1 TO Items-1
  110 FOR J%=I% TO Items
  120 IF Item$(I%)>Item$(J%) Temp$=It
em$(I%):Item$(I%)=Item$(J%):Item$(J%)
=Temp$:Swap=TRUE
  130 NEXT:IF NOT Swap THEN I%=Items
  140 NEXT:FOR I%=1 TO Items
  150 PRINT Item$(1%):NEXT
```

Get it right!

```
10 =    0 0 |  60 = C09D C | 110 = 287B 0
20 =    0 0 |  70 = F52B 6 | 120 =  A59 E
30 = 8B0B B |  80 = 1E31 4 | 130 = 103F 5
40 = F04B B |  90 = C508 A | 140 = 82A1 8
50 = 9CAB 8 | 100 = 1288 0 | 150 = 9C13 E
```

Title: Simple Terminal
Language: Basic
Author: Toby Simpson

Here's a quick terminal program which caters easily for both input and output. It switches between keyboard and RS423 input channels, routing the former to the RS423 output line and the latter to the screen.

The routine can be adapted easily for inclusion in another program, but it runs perfectly well on its own. You may need to adjust the input and output baud rates set in line 40.

```
   10 REM Simple Terminal
   20 REM by Toby Simpson
   30 MODE7:ON ERROR PROCend:END
   40 PROCos("FX7,4"):PROCos("FX8,4")
   50 REPEAT
   60 PROCos("FX2,2"):A%=INKEY(1)
   70 IF A%>-1 PROCos("FX3,7"):VDUA%
   80 PROCos("FX2,1"):A%=INKEY(1)
   90 IF A%>-1 PROCos("FX3"):VDUA%
  100 UNTIL FALSE
  110 DEFPROCend:PROCos("FX2")
  120 PROCos("FX3"):CLS:ENDPROC
  130 DEFPROCos($&700):LOCALX%,Y%
  140 Y%=7:CALL&FFF7:ENDPROC
```

Get it right!

```
10 =    0 0   80 = 55B1 3
20 =    0 0   90 = EDFC 9
30 = CBE0 0  100 = 226C D
40 = 181D 2  110 = 1234 2
50 = BFBA E  120 = 909B 6
60 = 2D4B B  130 = A38E 1
70 = CD02 E  140 = 50E0 8
```

Title: Easter Day
Language: Basic
Author: T.E.Shepherd

Certain religious festivals, like Easter, occur on different days and dates each year.

These movable feasts taxed the minds of many mediæval monks until they came up with special formulae which could predict which day a particular one would fall on in a given year.

A common programming task is to use these mediæval algorithms in a computer program. This one predicts which day Easter will fall for any year in the range 1985 to 2199.

The year number is used to generate two values which cross reference into a table that contains the correct date.

```
   10 REM Easter Day
   20 REM by T.E.Shepherd
   30 MODE7:DIM E$(19,6)
   40 FOR R%=1 TO 19:FOR C%=0 TO 6
   50 READ E$(R%,C%):NEXT:NEXT
   60 REPEAT REPEAT CLS
   70 INPUT"Which year (1985 to 2199)
",Y%
   80 UNTIL Y%>=1985 AND Y%<=2199
   90 A%=Y%+6+INT(Y%/4)
  100 SL%=A%-(INT(A%/7)*7)
  110 PRINT"Sunday letter = ";SL%
  120 C%=Y%+1
  130 GN%=C%-(INT(C%/19)*19)
  140 IF GN%=0 GN%=19
  150 PRINT"Golden number = ";GN%
  160 PRINT"Easter day is "E$(GN%,SL
%)
  170 PRINT"Another year?";
  180 REPEAT A$=CHR$(GETAND&DF)
  190 UNTIL INSTR("YN",A$)
  200 UNTIL A$="N":PRINT A$:END
  210 DATA Apr 16,Apr 15,Apr 21,Apr 2
0,Apr 19,Apr 18,Apr 17
  220 DATA Apr 9,Apr 8,Apr 7,Apr 6,Ap
r 5,Apr 4,Apr 10
  230 DATA Mar 26,Mar 25,Mar 24, Mar
30,Mar 29,Mar 28,Mar 27
  240 DATA Apr 16,Apr 15,Apr 14,Apr 1
3,Apr 12,Apr 18,Apr 17
  250 DATA Apr 2,Apr 1,Apr 7,Apr 6,Ap
r 5,Apr 4,Apr 3
  260 DATA Apr 23,Apr 22,Apr 21,Apr 2
0,Apr 19,Apr 25,Apr 24
  270 DATA Apr 9,Apr 15,Apr 14,Apr 13
,Apr 12,Apr 11,Apr 10
  280 DATA Apr 2, Apr 1,Mar 31,Mar 30
,Mar 29,Apr 4,Apr 3
  290 DATA Apr 23,Apr 22,Apr 21,Apr 2
0,Apr 19,Apr 18,Apr 17
  300 DATA Apr 9,Apr 8,Apr 7,Apr 6,Ap
r 12,Apr 11,Apr 10
  310 DATA Mar 26,Apr 1,Mar 31,Mar 30
,Mar 29,Mar 28,Mar 27
  320 DATA Apr 16,Apr 15,Apr 14,Apr 2
0,Apr 19,Apr 18,Apr 17
  330 DATA Apr 9,Apr 8,Apr 7,Apr 6,Ap
r 5,Apr 4,Apr 3
  340 DATA Mar 26,Mar 25,Mar 24,Mar 2
3,Mar Mar 29,Mar 28,Mar 27
  350 DATA Apr 16,Apr 15,Apr 14,Apr 1
3,Apr 12,Apr 11,Apr 17
  360 DATA Apr 2,Apr 1,Mar 31,Apr 6,A
pr 5,Apr 4,Apr 3
  370 DATA Apr 23,Apr 22,Apr 21,Apr 2
0,Apr 19,Apr 18,Apr 24
  380 DATA Apr 9,Apr 8,Apr 14,Apr 13,
Apr 12,Apr 11,Apr 10
  390 DATA Apr 2,Apr 1,Mar 31,Mar 30,
Mar 29,Mar 28,Apr 3
```

Get it right!

```
 10 =    0 0 | 140 = E612 D | 270 = D37B 2
 20 =    0 0 | 150 = 5EC0 A | 280 = 9911 6
 30 = 8F7C C | 160 = B56F 3 | 290 = 86A9 C
 40 = 4537 5 | 170 = 3CD9 6 | 300 = B131 C
 50 = 9348 0 | 180 =  B57 D | 310 = 3A88 E
 60 = 5F1D 6 | 190 = 37C9 3 | 320 = 5419 1
 70 = B8E4 0 | 200 = 9693 D | 330 = C01A 6
 80 = 4B93 6 | 210 = 4C25 1 | 340 = 308E 9
 90 = 718B E | 220 = 937D 4 | 350 = D005 7
100 = DCB9 0 | 230 = 47FC C | 360 = F369 7
110 = 3CCB 0 | 240 = 890C 8 | 370 = E399 9
120 = 49E7 2 | 250 = A1BC 2 | 380 = D5ED 7
130 = 7E0D 4 | 260 = 98B9 1 | 390 = F4CB 1
```

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THE MICRO USER PROGRAM Library No.10

Compiled by Steve Turnbull

Title: Anagram
Language: Basic
Author: Ian Fell

The problem of generating and solving anagrams is one which tickles most computerised crossword addicts at one time or another. Having analysed various methods, the only reasonable technique to do the job involves the use of recursion.

The program given here is the outcome. Input any length of string and it will generate all the possible combinations of those characters. Although the program will take any length of string, if it is over six characters the time taken to produce all the options is rather prohibitive – for a nine-character word it can take more than 20 hours to produce all variations.

Once all the set-ups have been done, PROCsort is called recursively to generate all the possible combinations. The loop from line 170 to line 150 has to be used instead of a FOR ...NEXT otherwise the Too many FORs error will be generated.

If you are using Basic I line 160 will fail due to the known INSTR bug, detailed on page 281 of the User Guide. Unfortunately there's no easy solution to the problem in this case.

```
   10 REM Anagram
   20 REM by Ian Fell
   30 MODE 7
   40 C%=0:D%=0:L%=0:Y%=0:Z%=0
   50 q$="":s$="":t$=""
   60 REPEAT CLS
   70 INPUT"Please type in anagram",s$
   80 L%=LEN(s$):D%=L%
   90 VDU-7*(L%=0):UNTIL L%>0
  100 PROCsort(q$,D%)
  110 PRINT"Permutations = ";Z%
  120 END
  130 DEF PROCsort(q$,D%)
  140 LOCAL C%:IF D%=0 PROCprint:ENDPR
OC
  150 C%=C%+1:j$=CHR$C%
  160 IF INSTR(q$,j$)=0 PROCsort(q$+j$
,D%-1)
  170 IF C%<>L% THEN 150
  180 ENDPROC
  190 DEF PROCprint
  200 FOR X%=1 TO L%:Y%=ASCMID$(q$,X%)
  210 VDU ASCMID$(s$,Y%);:NEXT:Z%=Z%+1
  220 IF Z%MOD24=0 PRINT
  230 PRINT:ENDPROC
```

Get it right!

```
 10 =    0 0     90 =  9D8 1    170 =  7F7 4
 20 =    0 0    100 = AD74 1    180 = ED0F A
 30 = 1092 2    110 = 4C44 0    190 = B5DC C
 40 = F021 3    120 = FD2E 9    200 = 41AF 5
 50 = E1FC F    130 = 5785 2    210 = B237 D
 60 = 7452 9    140 = 318E C    220 = DC91 7
 70 = 3CB8 B    150 = 95AB 8    230 = D333 6
 80 = 80A6 3    160 = A32D F
```

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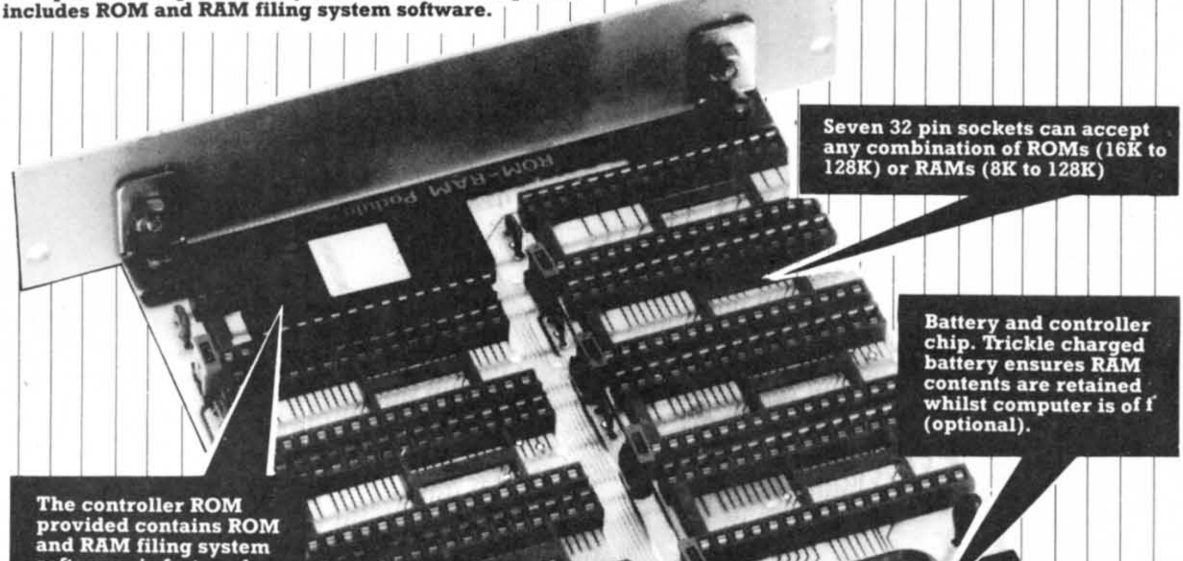

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Q How can I copy files from one disc to another using one disc drive?

A *This is not covered very well in the manual and what you need to do is use the *COPY command – but a little differently from the DFS version on the old BBC Micro. The full path name of the file should be specified as well as a drive number.*

A drive number can be given by a colon followed by a number and a full stop. Also the P for prompt option should be specified. Type:

```
*HELP COPY
```

for a list of all options available.

So, to copy a file called FRED that is in a directory MAN over to another disc use:

```
*COPY :0.$.MAN.FRED :0.$.MAN.FRED P
```

You may get a No room *message indicating that there is not enough free memory to do the copy. To remedy this type QUIT and you will enter the No language, operating system mode. The prompt will be a star so use the same command, but there is no need to type the star yourself.*

Another message you might get is Not found. *This is can happen if you have not got a directory called MAN on your destination disc so create one using:*

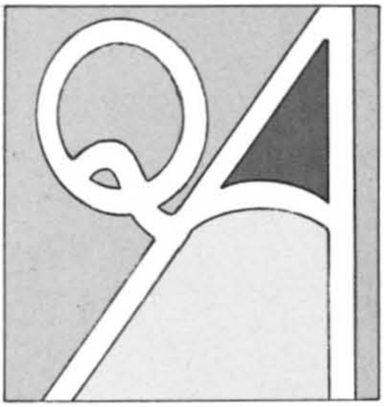
```
*CDIR MAN
```

When you are using wildcard characters in a filename to copy multiple files, you are best quitting from Basic and using the Q for quick option. This will use as much memory as the machine can grab and so minimise the amount of disc swapping. However, you will still have to swap the discs for each file copied so this only saves disc swaps if the file is long.

Q How can I run the Ram Basic on the Welcome disc?

A *There are currently two versions of Welcome disc depending on which operating system you have. If you have the 0.2 version of Arthur you should just be able to type:*

```
*$.Modules.RAM_BASIC
```



We are receiving a large number of questions about the Acorn Archimedes. Some of them are answered here, and we will be answering more over the next few months.

So, if you have any questions about the new super micro from Acorn don't hesitate to send them to: Archimedes Questions, The Micro User, Europa House, Adlington Park, Adlington, Macclesfield SK10 5NP.

If you try that on the 0.3 version of Arthur it will appear to run, but every time you try to execute a PRINT statement from Basic you will get the rather cryptic error message: SWI &46 not known.

To prevent this type in:

```
*RMLOAD $.Modules.VduExtend
```

either before or after entering Basic.

The Ram Basic is faster than the rom-based version and this is especially noticeable when the program spends a lot of time in the interpreter. So when it's executing a lot of complex-looking statements this can improve the speed by about one and a half to two times.

Q I have the newer 0.3 operating system and whenever I power up I get into the desktop. How can I stop this happening?

A *If you type *STATUS you will get a list of the currently configured options. Against Language you will see the number 3 and on a 0.2 operating system this means start up in Basic. However, in the 0.3 version it means start up in the desktop. To start up in Basic you need to enter:*

```
*CONFIGURE Language 4
```

followed by Control+Break. Using the number 2 or anything lower starts you off in the No language mode.

Q Recently a green region has appeared at the top of the desktop display. This does not appear to affect the screen when it has a black background – it only happens with a coloured background.

A *I strongly suspect that you have placed one or two external loudspeakers on top of the monitor to try to improve the sound quality from your Archimedes. Magnetic fields and computers do not mix and there is a danger of damaging your discs with fields from loudspeakers. In your case, however, the speaker has magnetised the screen and caused this colour distortion.*

Even with these speakers removed, the patterning may still persist – it could take a few days to disappear. If it does not disappear itself there is a solution: Your monitor needs de-gaussing.

This can be done with a de-gaussing coil, but might involve dismantling the monitor. Any good TV repair shop should be able to do this for you.

Q Some of the Basic programs on the Welcome disc have their first line as:

```
10 REM > name
```

where name is the filename of the program on the disc. Is there a good reason for this?

A *When you use the Basic editor and press f3 to save the file the name contained after the > in the first REM will automatically appear in the box. Then all you have to do is to press Return and it will be saved under that name. Or from Basic itself, just typing:*

```
SAVE
```

and Return saves the program under the REMmed filename.

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Z88 File archiving

John Allen shows how to prevent file loss

WITH the BBC Micro you get used to being able to store files, more or less permanently, on disc. Cambridge Computers' Z88 keeps files in ram memory, which means there may always be a worry that they could become corrupted and so lost, perhaps when you make a mistake and the machine crashes, or when you take too long to change the batteries.

Ironically, the more ram packs you have, and so more data to lose, the less time you get to change the batteries.

This utility takes all of your files on the Z88 and transfers them to an archive file stored on disc using your BBC Micro. In the event of a problem the routine can be used later to reload the files on to the Z88.

It runs on the BBC Micro, using either the DFS or ADFS filing systems, and links up to the Import/Export utility on the Z88 and transfers files using a serial lead. The one described on page 132 of the January 1988 edition of *The Micro User* is suitable if, in addition, pins 8 and 9 are connected together at the Z88 end. This connection is needed because the Z88 expects a voltage on pin 8 before it will receive data, and pin 9 provides +5 volts.

The utility takes the stream of files sent by the Z88 and stores them as a single one in a form that can be directly loaded back. It reports the full file description of each as they are received and sent. Files are restored with the same original name.

Because there are likely to be quite a number of files, and so a lot of data to transfer, the coding for the actual transfer has been written in 6502 machine code for maximum speed.

Type in the Archive program, ensure it's correct using Get it Right!, and save it before trying to run it.

First on the Z88 you need to select the control panel (□S) and in the top right hand corner to set the following:

Transmit baud rate	9600
Receive baud rate	9600
Parity	None
Xon/Xoff	No

Next, enter the Z88 Import/Export utility – □ X – and run the Archive program on your BBC Micro. To archive all Z88 files you should enter the following on the Z88:

```
S
:*//*
```

Press option one on the BBC Micro and enter a filename. Both the BBC Micro and the Z88 will then echo the Z88 filenames as they are being transferred.

To restore the files to the Z88, first ensure that there is enough room to accept the new data – if you are loading an entire memory full then you must wipe out all the current contents of the Z88. Run the Import/Export and Archive programs but this time, on the Z88, type:

```
B
```

Select option two on the BBC Micro and enter the archived data filename, then both machines will show the Z88 filenames as they are transferred across.

File selection

Trying to transfer more Z88 files than there is space for on your disc results in an error. There are a number of ways of avoiding this. If you have a Master and a double-sided drive the ADFS filing system allows up to 640k of data storage – which should be enough for most situations.

The problems arise with DFS machines – there are 100k on a 40 track disc and 200k on 80 track. If your Z88 files take up more space than that you will need to specify the files to transfer from the Z88 to stay within these size limits.

For example, if you have the internal memory of the Z88 – :ram.0 – plus a ram card in slot one, you can transfer the files from the two separately by first entering *:ram.0//** at the filename prompt on the Z88 and then *:ram.1//**, creating two files which can be on different discs.

A full description of the wildcards which can be used in Z88 filenames is on page 195 of the Z88 manual, from which you will see that other possibilities include sending specific directories or only files with certain extensions.

If you want to send individual files one by one from the Z88, modify the Archive program by removing lines 960 and 980 to 1040 and adding:

```
960 CMP #90
980 RTS
```

End the succession of files by executing the End batch command on the Z88.

● ***Next month** we present a handy utility which allows the Z88 to take control of a parallel printer attached to your BBC Micro.*

```
   10 REM Z88 Archive Program
   20 REM by John Allen
   30 REM (C) The Micro User 1988
   40 REM
   50 *FX15,0
   60 *FX229,1
   70 DIM oscbuff% 100
   80 *FX3,6
   90 PROCassemble
  100 *FX3,0
  110 MODE7
  120 blue$=CHR$(132)+CHR$(157)
  130 yellow$=blue$+CHR$(141)+CHR$(131)
  140 PRINTTAB(0,2)blue$
  150 PRINTTAB(0,3)yellow$;"The Micro Us
er Z88/BBC archiving"
  160 PRINTTAB(0,4)yellow$;"The Micro Us
er Z88/BBC archiving"
  170 PRINTTAB(0,5)blue$
  180 PRINTTAB(1,8)CHR$(134);"1) Archive
 Z88 files to BBC disc"
  190 PRINTTAB(1,9)CHR$(134);"2) Restore
 archived files to Z88"
  200 PRINTTAB(1,12)"Enter choice:";CHR$
(134);
  210 REPEAT action$=GET$:UNTIL INSTR("1
2*",action$)<>0
  220 PRINT action$;
  230 IF action$="1" THEN PROCreceive:PR
INT'CHR$(131);"Transfer completed.":END

  240 IF action$="2" THEN PROCsend:PRINT
 'CHR$(131);"Files restored.":END
```

◀ *From Page 47*

```
  250 REM
  260 REM a "*" command
  270 VDU31,0,15
  280 INPUT"*"command$
  290 ON ERROR REPORT:PRINT:GOTO 310
  300 PROCoscli(command$)
  310 ON ERROR OFF
  320 PRINT"  Press any key"
  330 action$=GET$
  340 IF action$="*" THEN PRINT:GOTO 280
 ELSE GOTO 110
  350 REM
  360 DEF PROCoscli($oscbuff%)
  370 X%=oscbuff%:Y%=oscbuff% DIV 256
  380 CALL &FFF7
  390 ENDPROC
  400 REM
  410 REM receive files from Z88
  420 DEF PROCreceive
  430 PRINTTAB(1,15)"Archive filename:";
CHR$(134);
  440 INPUT""file$
  450 ON ERROR GOTO 580
  460 handle%=OPENOUT(file$)
  470 ON ERROR OFF
  480 PRINTTAB(0,17)CHR$(131);"Receiving
 files from the Z88 ....."
  490 ?&80=handle%
  500 *FX7,7
  510 *FX2,1
  520 CALL receipt
  530 CLOSE#handle%
  540 *FX2,0
  550 *FX229,0
  560 ENDPROC
  570 REM
  580 REPORT
  590 PRINT"  Press any key":any%=GET:R
UN
  600 REM
  610 REM send files to Z88
  620 DEF PROCsend
  630 PRINTTAB(1,15)"Archive filename:";
CHR$(134);
  640 INPUT""file$
  650 ON ERROR GOTO 580
  660 handle%=OPENIN(file$)
  670 IF handle%=0 PRINT "file does not
 exist";:GOTO 590
  680 ON ERROR OFF
  690 PRINTTAB(0,17)CHR$(131); "Sending
files in ";file$;" ....."
  700 ?&80=handle%
  710 *FX8,7
  720 *FX3,7
  730 CALL sending
  740 CLOSE#handle%
  750 *FX3,0
  760 *FX229,0
  770 ENDPROC
  780 REM
  790 DEF PROCassemble
  800 DIM code% 250
  810 osrdch=&FFE0:oswrch=&FFEE:osbyte=&
FFF4:osnewl=&FFE7:osbput=&FFD4:osbget=&F
FD7
  820 FOR pass=0 TO 2 STEP 2
  830 P%=code%
  840 [
  850 OPT pass
  860 .receipt
  870 JSR osrdch
  880 .back
  890 LDY &80:JSR osbput
  900 CMP #27
  910 BNE receipt
  920 JSR osrdch
  930 JSR osbput
  940 CMP #78
  950 BEQ filename
  960 CMP #69
  970 BNE receipt
  980 LDA #129:LDX #50:LDY #0:JSR osbyte
  990 CPY #&FF
 1000 BNE continue
 1010 RTS
 1020 .continue
 1030 TXA
 1040 JMP back
 1050 .filename
 1060 JSR osrdch
 1070 JSR osbput
 1080 CMP #27
 1090 BEQ endfn
 1100 JSR oswrch
 1110 JMP filename
 1120 .endfn
 1130 JSR osnewl
 1140 JMP receipt
 1150 .sending
 1160 LDY &80
 1170 CLC
 1180 JSR osbget
 1190 BCS return
 1200 JSR oswrch
 1210 CMP #27
 1220 BNE sending
 1230 JSR osbget
 1240 JSR oswrch
 1250 CMP #78
 1260 BNE sending
 1270 LDA #3:LDX #5:JSR osbyte
 1280 .printname
 1290 LDY &80:JSR osbget
 1300 CMP #27
 1310 BEQ endname
 1320 JSR oswrch
 1330 JMP printname
 1340 .endname
 1350 LDA #3:LDX #4:JSR osbyte
 1360 JSR osnewl
 1370 LDA #3:LDX #7:JSR osbyte
 1380 LDA #27:JSR oswrch
 1390 JMP sending
 1400 .return
 1410 LDA #27:JSR oswrch
 1420 LDA #90:JSR oswrch
 1430 RTS
 1440 ]
 1450 NEXT
 1460 ENDPROC
```

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✓Get it right!

```
 10 =    0 0  500 = DA15 C   990 = F36C 9
 20 =    0 0  510 = 5123 4  1000 =  DF6 7
 30 =    0 0  520 = 4BC7 A  1010 = 9843 4
 40 =    0 0  530 = D31E 9  1020 =  2EE C
 50 = 6C86 6  540 = 4102 1  1030 = 5DFD 1
 60 = 5C2A 9  550 = 4C0B A  1040 = B33F 0
 70 = 3529 4  560 = ED0F 2  1050 = 39F8 3
 80 = 16F4 3  570 =    0 2  1060 = DFA2 3
 90 = 126A A  580 = 8FD9 1  1070 = 21CE 3
100 = 7632 A  590 = 6B69 A  1080 = F994 A
110 = 8AFC D  600 =    0 A  1090 = EA62 6
120 = 859F A  610 =    0 A  1100 = 9224 B
130 = DC9C 4  620 = 488C 7  1110 =  354 7
140 = A8A3 A  630 = 9871 C  1120 = 1FE7 2
150 = 4A2C 5  640 = DE71 1  1130 = 3334 C
160 = 8D89 4  650 = A632 A  1140 = 1234 F
170 = B1E7 2  660 = 91C0 E  1150 = D14A 9
180 = E803 2  670 = 1FDF E  1160 = E73F 9
190 = F9CE D  680 = F4C9 F  1170 = 74FB 6
200 = 1456 9  690 = D180 F  1180 = E44E 3
210 = 13CA 4  700 =  3BD 4  1190 = 1F92 0
220 = E02E 5  710 = F624 0  1200 = 9224 5
230 = 5F3F 7  720 =  6D5 1  1210 = F994 4
240 =  791 3  730 = A646 F  1220 = C8C6 F
250 =    0 3  740 = D31E B  1230 = E44E 7
260 =    0 3  750 = 7632 6  1240 = 9224 E
270 - 4E5B 3  760 = 4C0B 2  1250 = F78E F
280 = 9DB0 F  770 = ED0F 3  1260 = C8C6 E
290 = 8D3A 5  780 =    0 3  1270 = 91DB 1
300 = F7FD 9  790 = 98A5 1  1280 = 51C3 5
310 = F4C9 E  800 = 66B0 9  1290 = ACA6 8
320 = 6014 4  810 =  10B E  1300 = F994 4
330 = ECE1 1  820 = B43B D  1310 = 5B1A 0
340 =  753 6  830 =   7B E  1320 = 9224 B
350 =    0 6  840 = EB9E 1  1330 = 6ADA 4
360 = 45F2 A  850 = 46D4 B  1340 = 7603 1
370 = 8128 E  860 = 3CCB F  1350 = 92AE 8
380 = 17A4 7  870 = DFA2 9  1360 = 3334 9
390 = ED0F 8  880 = 5C49 A  1370 = 9731 D
400 =    0 8  890 = 6926 3  1380 = E750 5
410 =    0 8  900 = F994 C  1390 = FFB5 C
420 = 9E50 3  910 = 2547 C  1400 = F006 F
430 = 9871 9  920 = DFA2 D  1410 = E750 1
440 = DE71 A  930 = 21CE 2  1420 = 2BE4 F
450 = A632 F  940 = F78E 0  1430 = 9843 B
460 = EAA8 5  950 = D537 2  1440 = 8B58 1
470 = F4C9 9  960 = D49E C  1450 = 2C83 2
480 =  AB8 8  970 = 2547 3  1460 = ED0F 4
490 =  3BD 5  980 = B031 A
```

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Basic in the balance

Peter Davidson's game adds up to portable maths fun on the Z88

ONE of the first things I wondered when I started looking at Basic on the Z88 was whether any sort of animation was possible. I soon discovered that, unfortunately, the screen refresh time is far too slow for any fast arcade games, but I thought some animation should be possible – provided the movement is at a steady pace.

I looked back in the archives of *The Micro User* and found an educational game – Balance – in the February 1984 issue which was an ideal candidate for easy conversion to test my theory.

I made all the obvious changes to accommodate the screen size, tested the program on my BBC Micro and transferred it to the Z88.

The only problem was VDU31 – the equivalent of TAB – did not position the cursor, so some of the printing was in the wrong place. I replaced them with TAB and the program worked.

So here is Balance, a program to test your powers of mental addition.

Key it into your BBC Micro and transfer it to the Z88 as described in last month's issue, or key it directly into the Z88. I recommend the former as it allows you to use the Get it Right! checksums and built-in Basic editor on the BBC Micro.

When you run the program the sum appears on one pan of the scales and the answer you enter on the other.

The pans balance when the answer is correct, otherwise they tilt. It's not always easy, but it is fun to play.

This educational game will also work on all versions of the BBC Micro if the following line is added:

```
1 MODE0:COLOUR 0:COLOUR129
:VDU28,0,18,79,11
```

```
   10 REM Z88 Balance
   20 REM (c) The Micro User
   30 REM By Pete Davidson
   40 CLS
   50 PROCINIT
   60 GOES=0:REPEAT:GOES=GOES+1
   70 PROCSELECT
   80 PROCCENTRE
   90 PROCINPUT
  100 UNTILGOES=NUMQUES
  110 PROCRESULT
  120 IFLEFT$(REPLY$,1)="Y" ORLEFT$(REPL
Y$,1)="y"THENRUN ELSE CLS:END
  130 DEFPROCINIT
  140 PRINTSPC(20)"NUMBER BALANCE"
  150 INPUT'"How many questions do you w
ant? "NUMQUES
  160 IFNUMQUES<1THENVDU7:GOTO150
  170 INPUT'"What is the highest number
in any question to be (2 TO 99)? "HIGH
  180 IFHIGH<2 OR HIGH>99 THENVDU7:GOTO
170
  190 INPUT'"What is your name? "NAME$
  200 SCORE=0
  210 ENDPROC
  220 DEFPROCSELECT
  230 NUM1=RND(HIGH)
  240 NUM2=RND(HIGH)
  250 DISPLAY$=RIGHT$(" "+STR$(NUM1),2)+
"+"+LEFT$(STR$(NUM2)+" ",2)
  260 ANS=NUM1+NUM2
  270 ENDPROC
  280 DEFPROCPAN(X,Y,DISPLAY$):X=X+1
  290 IFY>=0PRINTTAB(X,Y+1)"       "
  300 PRINTTAB(X,Y+2)" "+DISPLAY$+" "
  310 PRINTTAB(X,Y+3);:VDU92,95,95,95,95
,95,47
  320 PRINTTAB(X,Y+4)"       ";
  330 ENDPROC
  340 DEFPROCCENTRE
  350 CLS
  360 PROCPAN(0,1,DISPLAY$)
  370 PROCPAN(13,1,"    ")
  380 ENDPROC
  390 DEFPROCINPUT
  400 VDU7:PRINTTAB(35,3)"What is the an
swer? ";
  410 REPLY$="":ANS$=STR$(ANS):FORI=1TOL
EN(ANS$)
  420 A=GET:IFA<>13AND(A<48 OR A>57)THEN
420 ELSE A$=CHR$(A): PRINTA$;:REPLY$=REP
LY$+A$:NEXT:REPLY=VAL(REPLY$)
  430 REPLY$=LEFT$(" "+REPLY$+"    ",5)
  440 IFANS=REPLY VDU7:PROCCORRECT
  450 IFANS>REPLY VDU7:PROCSMALL
  460 IFANS<REPLY VDU7:PROCBIG
  470 IFGET<>32THEN470
  480 ENDPROC
  490 DEFPROCBIG
  500 PRINTTAB(35,1)"TOO BIG"
  510 PROCMVE(-1)
  520 PRINTTAB(35,3)"THE CORRECT ANSWER
IS "DISPLAY$;"="ANS$;':PRINTTAB(35,5)"PR
ESS SPACE";
  530 ENDPROC
  540 DEFPROCSMALL
  550 PRINTTAB(35,1)"TOO SMALL"SPC35
  560 PROCMVE(1)
  570 PRINTTAB(35,3)"THE CORRECT ANSWER
IS "DISPLAY$;"="ANS$;':PRINTTAB(35,5)"PR
ESS SPACE";
  580 ENDPROC
  590 DEFPROCMVE(P)
  600 YL=1:YR=1
  610 FORI=1TO2
  620 YL=YL+P:YR=YR-P
  630 PROCPAN(0,YL,DISPLAY$)
  640 PROCPAN(13,YR,REPLY$)
  650 FORJ=1TO500:NEXT
  660 NEXT
  670 ENDPROC
  680 DEFPROCRESULT
  690 VDU7:CLS:PRINTSPC(22)"RESULTS"
  700 PRINT'"You got "STR$(SCORE)" quest
ions right out of the "STR$(NUMQUES)" qu
estions that you tried"
  710 INPUT'"Do you want another try? An
swer yes or no, then ENTER. "REPLY$:ENDP
ROC
  720 INPUT'""REPLY$:ENDPROC
  730 DEFPROCCORRECT
  740 SCORE=SCORE+1:PROCMVE(0)
  750 VDU7:PRINTTAB(35,1)"WELL DONE "NAM
E$
  760 PRINTTAB(35,3)"YOU ARE RIGHT"SPC20
  770 PRINTTAB(35,5)"PRESS SPACE";
  780 ENDPROC
```

Get it right!

```
 10 =      0 0  270 = ED0F A  530 = ED0F C
 20 =      0 0  280 = 7641 A  540 = F616 F
 30 =      0 0  290 = EFE8 E  550 = 8FD9 8
 40 = 7A16 6  300 = C219 1  560 = CDCE 4
 50 = 4DB7 1  310 = 64BC A  570 = 1A20 D
 60 = C510 5  320 =  C28 3  580 = ED0F C
 70 = 562D 3  330 = ED0F 5  590 = 9554 4
 80 = E7C0 3  340 = 8741 8  600 = 592E B
 90 = DADB 6  350 = 7A16 A  610 = 9A83 C
100 = C699 2  360 = AD27 8  620 = 776A 2
110 = 8F99 0  370 = 6CFB A  630 = D9B2 D
120 = A88A 9  380 = ED0F 0  640 = 34D8 E
130 = A740 9  390 = 71BF F  650 = A93F 7
140 = 54AD 8  400 = FA51 2  660 = 2C83 C
150 = B862 C  410 = 3568 9  670 = ED0F A
160 = 47E4 1  420 = 4854 B  680 = EF18 D
170 = 8DBC 0  430 = E8BD 8  690 = 4710 F
180 =  CA1 8  440 = 979F 5  700 = 7A80 D
190 = D6D3 9  450 = 87B8 8  710 = A027 2
200 = C9E0 6  460 = 736E 4  720 = D677 7
210 = ED0F 3  470 = 1BFF 2  730 = F8A1 A
220 = 36AC B  480 = ED0F D  740 = 92A3 E
230 = 9589 8  490 = 9807 8  750 = 8C2A 3
240 = B8CD 3  500 = 5C36 7  760 =  CCF 0
250 = 5639 4  510 = CF72 E  770 = 55A9 F
260 = 9C5B 4  520 = 1A20 2  780 = ED0F 3
```

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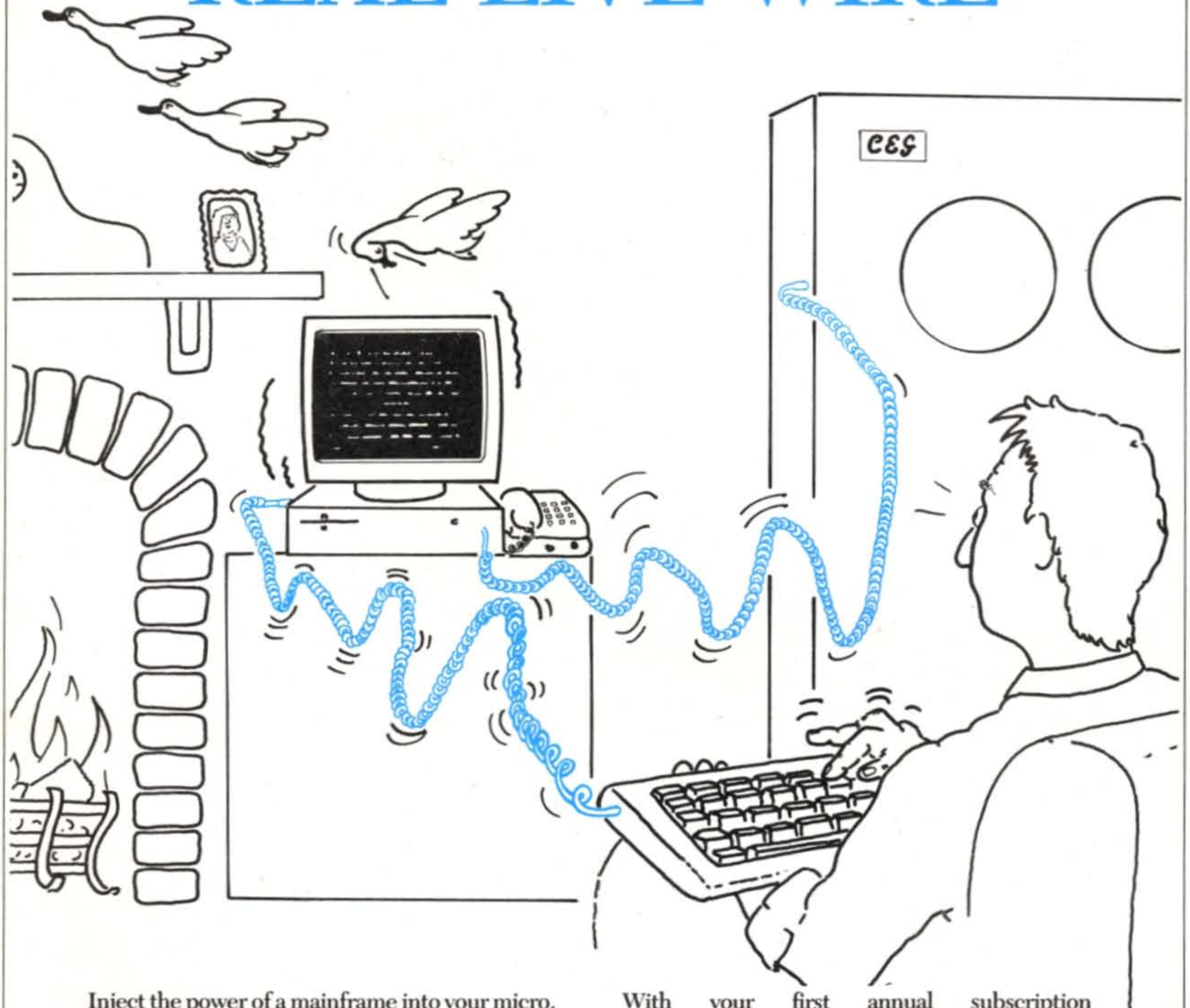

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Remote computing

Peter Davidson goes on line with a Z88 and a portable modem

ONE of the problems I find when I'm at an Electron and BBC Micro User show is how to check my mailbox on MicroLink. I usually have to find an exhibitor who is demonstrating a modem and beg a few minutes of online time. Now, that's a thing of the past. Using a Z88 and Epson CX21 modem I can send messages all over the world via MicroLink using just my battery-powered system and any convenient telephone.

There is communications software available on rom for the Z88, but for most purposes the built-in terminal – selected using □V – works efficiently so you may as well save your money. Here's how to get on line even from places as far away as Tenerife.

The modem simply plugs into the Z88 and you should ensure that the two switches on the side of it are set to Full and Orig and the hardware is ready.

As for the software, the first thing to do is set the communication protocols. This is done from the Panel of the Z88, so select this from the index by pressing □S. The items that need changing are the baud rates and the parity but, as the present settings are probably the ones you use when you transfer files to your BBC Micro, it's a good idea to save them before making any changes.

From the Panel itself, press ◊FS to move to the File Save menu and enter a filename – say PAN-BBC. When you press Enter you will be returned to the Panel ready to make your changes. At any time you want to send files to the BBC Micro just go to the panel, enter ◊FL and key-in PAN-BBC to reload your default settings.

Now the default panel is saved for future use, edit the display to the MicroLink settings: Move the cursor to the Transmit baud rate, delete it and enter 300. Do the same for receive rate, then move the cursor to Parity. Cycle through the options available – using ◊J – and leave it set to SPACE.

You can then save these panel settings – say as PAN-300 – in the same way as when you saved the BBC Micro transfer protocols. Any time you want to reload either set just enter ◊FL from the panel and key in the appropriate filename. Everything is now set ready to go on line, so press □V to go into terminal mode.

Switch on the modem, dial 01-583 3000 (or a local MicroLink number) and, when you hear the tone, put the handset in the modem. The connect light should illuminate and you should enter:

```
CALL 72
```

Then type your identity and password – just as you usually do on your BBC Micro. Once you are connected to MicroLink type SS and, from the Terminal Type menu that appears, select Z88.

Table I shows how to prepare a file before you go on line, and the keys you use and instructions for tasks you may want to carry out while you are on line are shown in Tables II to IV. Table V is a quick reference guide to getting on line and Table VI shows how to view a file you have received.

And that's all there is to communicating from any telephone that fits into the modem. It's almost as easy to check your mailbox from a hotel phone as it is from home or the office.

- Enter Pipedream in the usual way.
- Start your text with the following two lines:

  #V

  .J
- Key in your text.
- Press ◊FS to enter the File save menu.
- Change the Save plain text option to Yes.
- Type in any filename you want and press Enter: The file is ready to send.

Table I: Preparing a file off line.

- Prepare a file as described in Table I.
- Enter communicate mode as described in the text and summarised in Table V.
- When you are ready to send the file press □F to take you to the Filer menu.
- Press ◊EX for execute.
- Enter the filename of your prepared text.
- As you press Enter you will be returned to Communicate mode and see your file being transmitted.

Table II: Sending a file.

- While you are communicating, press □ followed by + and S and the screen output will be saved to a file :RAM.-/S.sgn.
- When you have finished receiving the file, close it by pressing the keys □-S.
- If you want to receive any more files, rename the system-generated one by pressing □F followed by ◊RE and entering s.sgn for Name and any filename for New name.

Table III: Receiving a file.

◊S Stop text scrolling.
◊Q Restart text.

Table IV: Important keys while on line.

- Select Panel with □.
- Save current settings with ◊FS.
- Edit settings or load new ones with ◊FL and press Enter.
- Enter terminal with □V.
- Switch on modem.
- Dial 01-583 3000.
- When you hear the tone, put handset in the modem.
- Type CALL 72
- Enter your ID and password in the usual way.

Table V: Summary of how to get on line.

- Enter Pipedream by pressing □P.
- Enter ◊FL and use the filename :RAM.*/S.*.
- Set the width to 60 using ◊W.
- Set the margin to 60 using ◊H.
- Press ◊R to reformat each paragraph until you reach the end.
- Move up and down the text to view it in the usual way.

Table VI: Viewing a file.

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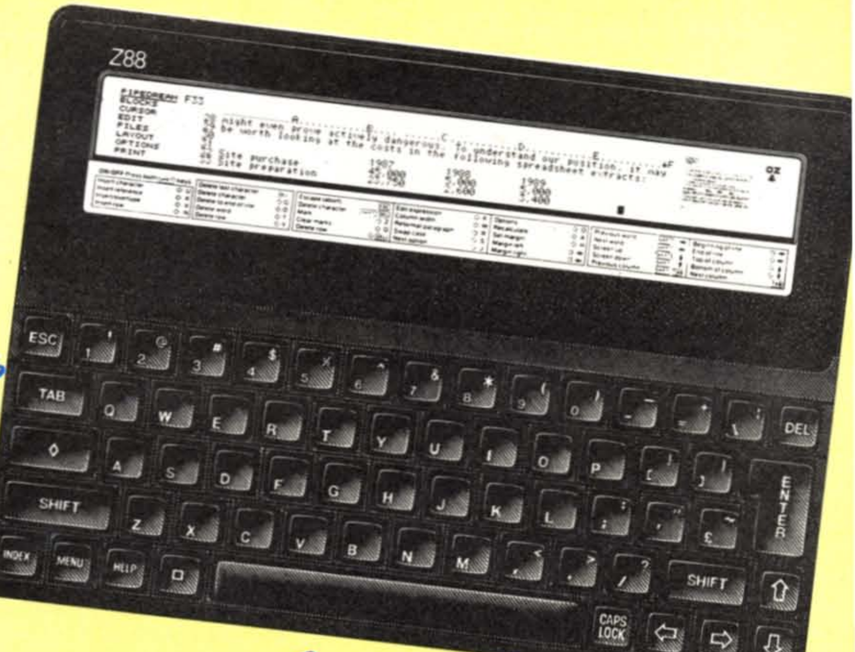

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MU3

Try putting it on ice

Mike Cook examines a neat integrated circuit emulator that cuts costs

ICE stands for intergrated circuit emulator and Ice-King from Lancaster Consultants emulates that king of ICs the 6502 microprocessor. Well, why pay £250 for an emulator when you can get the real thing for under a fiver from Watford?

The point is that if you are making your own microprocessor system an emulator will allow you to take the lid off the central processing unit – CPU – and see what is happening. In this way, the theory goes, you will be able to develop and debug software and hardware much more quickly.

Ice-King consists of a sideways rom and an interface that plugs into the 1MHz bus. Out of this interface – which has all its components set in solid black epoxy resin – comes a ribbon cable with a 40 pin dual in-line header plug. This is inserted in the system you are making – the target system – in place of the 6502 chip.

Then your BBC Micro – the host system – can generate all the signals normally produced by this chip. This means the host computer can look at all the information – data and instructions – as it flows into and out of the 6502.

This allows you to see what instructions are being fetched and what effect they have on the registers and flags. However, because your target system is being driven directly, all the hardware attached to it will work in the same way as it will in the final application.

Built-in assembler

Instruction code can be fetched either from the target machine or from the host. The great advantage of the latter is that you can use the BBC Basic built-in assembler to generate your code and then later, when you know it works, transfer it into eprom for running on the target system.

In this way a program may be forced to run even if the target system has faults on it that would normally prevent it from working. This overcomes one great problem in commissioning a system, namely that more than 90 per cent of the circuit must be operating before anything will work.

That's the theory, so let's see how Ice-King measures up. The power for the emulator interface is drawn from the target system in the same way as the microprocessor would in its final configuration. However, the emulator takes slightly more current than a microprocessor. This could be seen as an advantage, as it forces you to allow an adequate safety margin on your power supply requirements.

Menu options

The driving software is fitted into sideways rom and is called up with *ICE. You are then faced with a menu of eight choices. The first is a memory inspect and change, and allows you to single step through memory, altering each location.

Like most of the menu options, you can operate this in the local or remote mode. In the local mode the memory locations are those inside the host computer whereas in the remote mode, memory in the target system is used.

As well as single memory location examination, the Window option allows you to look at 64 bytes at a time viewed in both Ascii and hex. There is a disassembler which works on a line-by-line basis or on a whole block, and also has the ability to transfer blocks of code between the two systems.

The most important option from the menu, however, is the emulator which executes the programs. In single-step mode the address, instruction mnemonic and register state are displayed after each instruction is executed. So you can see exactly what effect your program is having on the inside of the microprocessor.

When an interrupt request – IRQ – is received, the display turns blue, or red if it is a non-maskable interrupt – NMI. Then, if the appropriate flags are set, the interrupt service routine can be executed by pressing a key. This can also be single-stepped and in addition it is possible to set a number of break points.

The only problem with emulators in general is that they do not work as fast as the original microprocessor – the Ice-King runs at about 1/100th of normal speed. This is normally quite all right as single-stepping at full speed would be a little silly.

However, when it comes to servicing frequent interrupts, an emulator can become saturated by the interrupt task and have little time for the foreground task. Therefore when you are developing a system that has to respond to frequent and rapid interrupts you will not be able to perform a full emulation.

Ice-King also makes some economies in some of the more obscure signals generated by the 6502 microprocessor. The synchronising clock signal is fed straight from the 1MHz signal on the BBC Micro and the other phases of the clock are not synthesised.

Also the sync out signal that identifies an op-code fetch is not produced. This will not be of concern to the vast majority of target systems, but I think these points should have been mentioned in the documentation.

The 18-page manual covers the basics of driving the emulator. However to my mind it does not give enough technical information about the system, nor any hints and advice on how to go about tracing faults on a target system. That said, perhaps anyone who would want to use an emulator would know what he is doing anyway.

To help speed your development of a target system, Lancaster Consultants can provide a simple 6502-based system with space for 4k of eprom, 2k of ram and a 6522 VIA. There are also add-on boards for this to give a serial interface, optically-isolated I/O and an analogue to digital converter. This makes the development of stand-alone systems easy and economical.

When compared to other emulators Ice-King is very reasonably priced, as you are normally talking in the £5,000 to £20,000 price bracket. I see this system finding favour in many educational establishments where dedicated microprocessor systems are studied. Also in consultancy work, and for the dedicated hobbiest it will no doubt find a home.

Product: Ice-King Hardware Microprocessor Emulator
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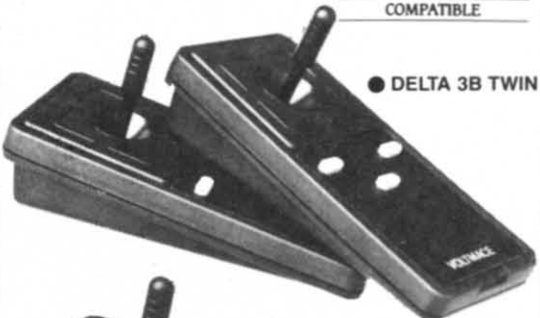
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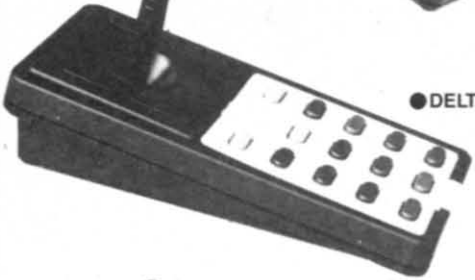
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THE MICRO USER

INNOVATION AWARD

Goodbye Innovation Awards 1987 . . . Hello Innovation Awards 1988. Here are the final reports featuring the last three runners-up in The Micro User Innovation Awards 1987.

But it's not all over. Far from it. Such was the interest created by the inaugural competition that it has been decided to make it an annual event.

Details of this year's competition can be found in the news pages.

Youth has its day

Special recognition was given to the youngest entrants for the Innovation Award – budding publishers William Bryan (11) and his friend Tim Sargeant (12).

The Sudbury, Suffolk, youngsters use a BBC Micro to produce a weekly magazine, about computing, which they sell at their school.

With help from Fleet Street Editor and Interword, they write news and feature items on the computer and lay out the printouts on A4 pages before photocopying them.

The idea of the publication is to provide information for their schoolmates aged between nine and 12 to enable them to learn more about computing. The magazine – priced 10p to offset production costs – is one of the school's most popular projects.

BBC Micro 'bloodhound'

Measuring blood patterns in the brain of a hospital patient is a relatively straightforward task, even though it usually takes a 16-bit mini computer, small field gamma-camera and the resources of a medical radioisotope department.

If the patient is very ill and is best not moved from one end of the hospital to the other – yet requires repeat scans to monitor his progress – the task becomes more difficult.

The Western General Hospital in Edinburgh has overcome the problem with a BBC Micro-based system which formed the entry of medical physics technician C.M. Ferrington who lives in South Queensferry, West Lothian.

A second-hand gamma-camera is sited in the neurology department close to the patients it is required to scan. Alongside it is a linked BBC Micro system.

The BBC Micro controls the acquisition of 256 1k images collected from the patient over 80 seconds following the injection of a radioactive tracer. At the same time, a second small radiation detector is monitoring the injected activity as it flows through the heart, and a curve of this activity is built up in the data logger.

Both total brain and heart radioactivity levels are plotted on-screen by the micro during the acquisition to show that things are proceeding normally.

At the end of the scan the data is transferred from the 256k datalogger memory via the BBC Micro on to a floppy disc. The disc is then taken to another BBC Micro linked to the mini computer system via the RS423 port.

A certain amount of preprocessing is carried out by the BBC Micro. The heart curve is fully analysed, and the brain images are summed together in groups to form a 20-frame sequence of the relevant part of the scan before sending to the mini for processing into the final blood flow parametric images.

Help for amnesia victims

Bristol neuropsychologist Dr Seldon Curry developed a home-based rehabilitation programme to assist patients with severe head injuries to make a full and speedy recovery.

Patients either enter the programme as soon as possible after their accident – usually on emerging from a post-traumatic amnesia of at least a week – or after several years of recovery.

The basic idea of cognitive rehabilitation is provision of a structurned and progressive set of stimulating and intellectually challenging material designed to exercise the more general areas of cognitive impairment following cerebral trauma.

These areas include attention span, attentional control, impoverished memory, slowness, logical problem-solving, and so forth.

Dr Curry decided to present this material via a small, relatively inexpensive computer, so that the rehabilitation programme that could be primarily home-based.

Patients use their own – or a loaned – BBC Micro, Master or Compact, and are provided with the necessary peripheral equipment including hi-res colour monitor and modem. A network system was developed allowing each of the remote machines in patients' homes to be linked to a central computer at the Burden Neurological Institute in Bristol using modems.

The network system provides both continuous control over the patient's rehabilitation programme and the monitoring of his or her performance.

The electronic mail link is only connected for the transmission of programs and receipt of results, which ensures that telephone charges don't become unreasonable.

by
The Mad Hatter
10/6

Soap suds work up a fun lather

THIS month we start with some good news and some bad news. First the good news: Geoff Larsen has sent me details of his latest adventure, **Hex**. Set in peaceful Cornwall, it offers an eerie romp as the player gets involved in various dark doings. Look out for a full treatment as soon as the game itself lands on my desk.

Bad news is that Rob O'Leary has been underwhelmed at mail order sales of recent Robico adventures. If it means that interest from BBC Micro owners is flagging, Rob will turn his attention solely to Archimedes games. You have been warned.

It's happened again: A tape arrived some weeks ago – hand-lettered Demo copy. I put it on one side and almost forgot it. If I had, another valuable contribution to the BBC Micro adventure scene would have gone unremarked by yours truly – a fate like Wordsworth's Lucy, of whom he wrote that very few knew or loved her.

Suds, by Riverdale Software, 95 Printon Avenue, Manchester M9 3JW is a four-part Quilled adventure on cassette for the BBC Micro which will run on the Master 128. At £4 it is excellent value for money – available by mail order and some retail outlets.

The title rightly hints that it is a soap opera spoof. You start at Emeroyd Farm – a rotting pile if ever I saw one – and your task is to win a part in East Enders since a misguided bull appears to have demolished the rest of the cast in your own show.

The style of humour can be judged by the fact that the scene opens with a frog busy phoning the AA for a traffic report, and that later in part one you come across some tadpoles learning the green cross code!

I found the initial frog worth closer examination as well as some osculatory exploration. It proved the key to all that followed.

Each part can be played separately even though, strictly speaking, Suds should always be played through systematically. If you survive part one, you arrive in Manchester, where you have to experience the trials and tribulations of Abdication Street.

Part three features the Cross Eyes Motel and if you can cope with that, off you go to the Dead End of London for the final scenario. Response is at times amusing – trying to pick a lock without the appropriate instrument caused me to learn that there were other things I couldn't pick, either. I approve of the bad language response in part one too – you get sent back a number of spaces.

An interesting command provided is LOCATION – which gives a number for each one in the game: Maze mapping is thus much easier.

Add this one to your collection, and look out for my comments on **American Suds**, again by Riverdale, in the next issue, since that adventure has just reached me.

See you next month. Until then, happy adventuring.

MOTE
DEN
ALBER

Helpline

Barbara Gibb – an old friend of this column – offers other readers help as follows:

Dodgy Geezers: The password is SWORDFISH, found on the box of matches in the snug bar. The club opens on Friday night so be ready to enter at about 91 turns.

Wizard's Challenge: The finger needs a nurse to bandage it. The medical room is in the classroom area.

Go to the end of the corridor, search so that a teacher takes you to the Head's office where you can take the keys. From there go W, W, N and N where a nurse will do the necessary. Don't forget to take any spare bandages left lying around.

Blue Dragon: PLAY FLUTE, and when you stop the wizard will be so grateful he frees the bird from the spell.

Firienwood: Use the spell NEIRIF to escape the blizzard.

Barbara is stuck in **Village of Lost Souls**: She needs to go to the cabbage patch for the kid who will pacify the goat.

Elite Tips III

When you have finally arrived at Cearso in Galaxy Two – no doubt rather battered, since this is the first Anarchy system I have led you to – use f6 to obtain the next message. The fugitive Constrictor has gone to Errius, which is a long trip.

I chose the following route to maximise trade and minimise combat, but I'll leave you to work out the trading options: If you've followed the last two months' advice, you should have no problems.

From Cearso go to Labilaen, Ustile, Arines, Beused, Usedge, Erlaened, Maeseron, Esbete, Anusa and so to Errius.

You'll then be sent to Inbibe, which means going back to Anusa and then via Laribebi.

At Inbibe the message will tell you that the Constrictor has gone to Ausar – an Anarchy system. There are two routes to choose from, depending on how confident you feel. The shorter is via Dixeza – another Anarchy system. The second voyage involves returning to Laribebi and then going to Esbete before attempting to enter the Ausar system.

I tried them both on your behalf, and have to report that I arrived in a similarly battered state, with Front Shields well depleted, whichever route I took. At Ausar you will be told that your destination is Usleri. Be careful here: Although the short range chart doesn't show it, this planet is only 6.8 light years away.

Use the long range chart, press the F key to locate it and then launch yourself.

When you reach Usleri you'll be told that the killer is at Orarra – not far away, via Zatebiso.

On arrival at Orarra the message tells you that the Constrictor is roaming the system and you are welcome to tackle him.

Launch yourself, head away from the space station until you are out of the safe zone, then jump. Your opponent will be a single ship, never in company, easily recognisable – but it may not turn up at once.

I conducted this part of the Mission three times, and here are the results. Sortie 1: One jump away from the safe zone I faced an attack wave of four pirates and destroyed them.

After that, the Constrictor appeared and it was a question of undisturbed single combat during the course of which it fired four missiles straight at me.

I destroyed them with my ECM system, finished off the Constrictor and returned to the space station without further interruption. Combat time – about five minutes hard work.

Sortie 2: I made about 20 jumps from Safe before anything actually happened. I then faced attack waves of three, two and four ships respectively before the Constrictor appeared again.

During our combat, it again fired four missiles which this time I destroyed by laser fire, but now the process was interrupted by pirate attacks.

Twice single ships interfered and finally a wave of three attacked me together. After destroying the Constrictor, I was attacked by eight hostile ships on the way to the space station. Combat time – about 10 minutes.

Sortie 3: Seven jumps out, the Constrictor appeared, and again fired four missiles. We were interrupted by a single pirate and I met another four on the way back.

Combat time – about four minutes and then it was, "Come along, darling, your lunch is getting cold".

The main lesson is this: Hold on to that Constrictor like a terrier and keep hitting it. It will take a lot of punishment before exploding. The moment it is destroyed you are awarded Dangerous status.

Hall of Fame

Marcus Turner has sent in a superbly detailed solution to that excellent Robico adventure **Rick Hanson**, but can someone help him in **Stryker's Run 2**? How do you get the jet pack and key on section 2 Crew's Quarters?

Thanks also to Dave Hunt for a solution to **Suds**, and to Kay Chappell for her full solution to **Wizard's Challenge**.

Problem Corner

James Harwood is in trouble with **Dennis Through the Drinking Glass** and I don't have the game: How does he get the drink? Would anyone care to send me a solution?

Return to Eden Solution Part One

As I introduce another game solution it's worth restating my policy on this sort of thing. I will not publish solutions to games that are very much part of the current scene: I don't believe that's fair.

On the other hand, readers often tell me that by publishing solutions to older adventures, I stimulate them to try again when they have been stuck for months or even years.

Return to Eden is the part of the Silicon Dream Trilogy by Level 9 that I enjoyed most. Once again, you will still have to map the game carefully in order to complete it – I don't believe in making things too easy!

At the start, move in to the cupboard, wear the radsuit and take the compass and geiger-counter. Go out, out, and East to the molehill, then dig into it. Locate and sleep in the cave with leaves, find the spade and dig in the loose earth.

Travel East to the forest, but remove the radsuit before entering.

Turn to Page 60 ▶

Return to Eden Solution Part One (continued)

◀ From Page 59

then find and eat the bean so that you can carry more objects. Collect tubers, stem, airseed, wishbone, stonefruit and take the sweet pea and drop it to get the egg, then plant it with the spade to create the houseplant.

Go in to find the fish fungus needed by the leviathan. Look through the telescope and return it. I wore the fig leaf rather than the tradclads.

Cross the river, feeding leviathan on the way, and eat the pill to avoid radiation sickness. The parrot's nest needs to be found in the maize if something has been stolen. From the riverbank go N, E, W, and S to the nest, then S to leave the maize.

When you have everything, relaunch the canoe, go S to get the log and then E to the island. Once you are on the tiny island, squeeze the log and the bulb will become a parachute. You can now go safely down.

Explore the jungle area thoroughly. Dig at the twisted tree to find your roots which are an essential item later in the game. Find the bug and the rubber band, go to the woodpile and throw the clingvine so you can climb up into the trees.

Drop six objects – but not the stone fruit – at the platform so you can then go higher up in the trees when the lever on the other platform is pulled. Mend the branch with the glue berry.

You are only allowed to take one object across the branch at a time – so take the stalk first. The cherry is a grenade that will explode if you drop it. You will then be heavy enough to go back down again.

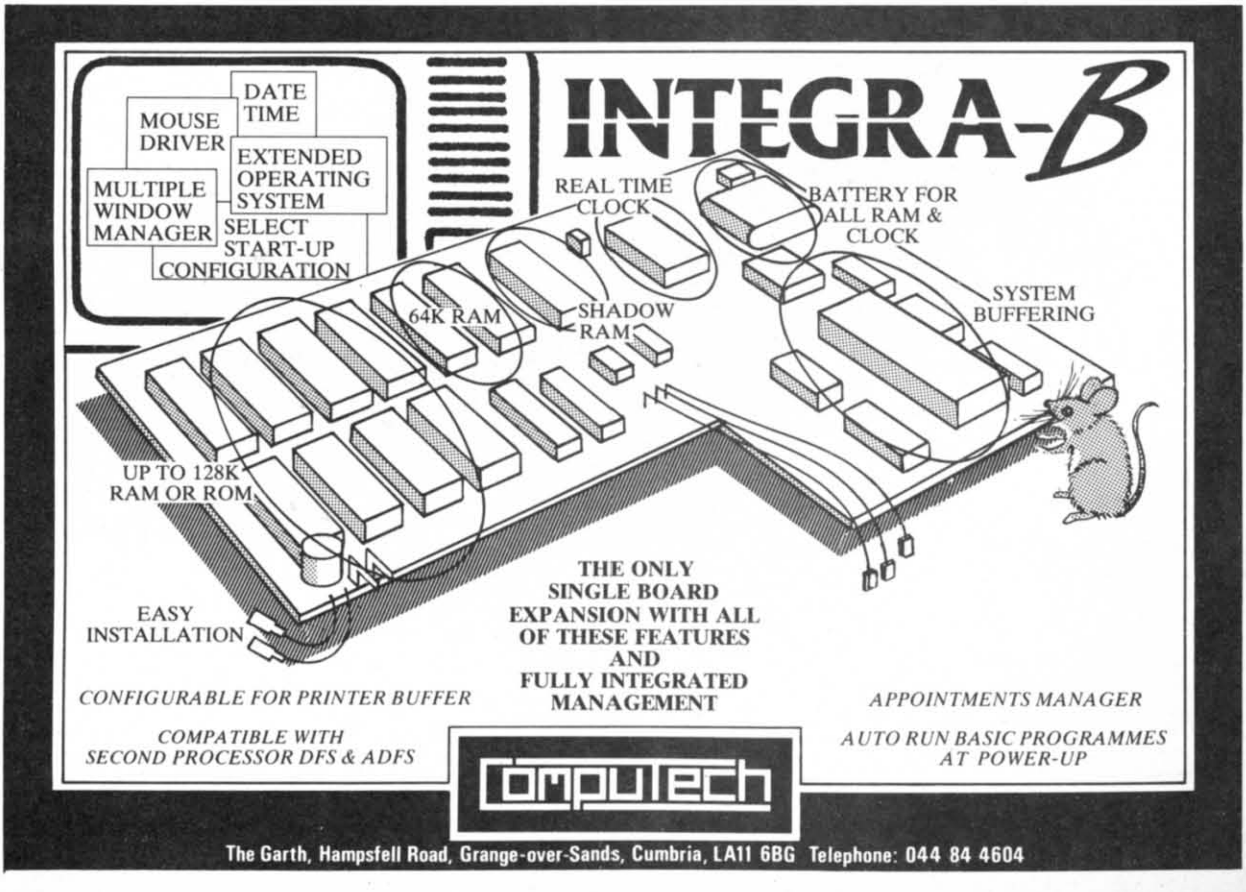
Before leaving the trees make sure nothing is left on the south platform, or else it will be lost forever should you use the north platform with the lever as a short cut to ground level.

Wear the foxgloves to take the cold leaf and freeze the bog by dropping the leaf so you can get and wear the cloak.

Play the stalk with twigs and the ants at the leaf pile will follow you. Lead the ants to the fence and they will trample it down.

Wear the cloak and carry the bug. Make a catapult by tying the rubber band to the wishbone, then fire the cherry bomb to make a path through the minefield.

Wait at the beach for the autoscythe machine and then get out at the east end of the beach. Wait again for the weeder, but let it dump the rubbish before getting in. You can get out at the NW corner of the wheatfield, but make sure you have the stone fruit, spade and air seed. Then go North into the river and take the credit card before emerging.



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Genie enhanced

Paul Hendy investigates two utility packages for the perfect add-on

THE review of Genie in the October 1987 issue of *The Micro User* concluded that it was an excellent piece of software and well worth the money. Comments were made to the supplier, Permanent Memory Systems, about the desirability of some extra printing and spooling options, and as a result the company has enhanced the product by developing a disc of Genie utilities.

The disc is loaded with the usual Shift+Break, after converting it as necessary to 80-track format and DFS/ADFS, which is explained in the manual. You must have shadow ram turned off, and a message to this effect appears if you accidentally leave it on.

You are then presented with a menu of five options, selectable either by moving the highlight bar with the cursor keys, or by pressing the appropriate number. Perhaps a very minor modification here would be to make the selection conform to Genie itself, which immediately processes the keypress: With the disc you have to press Return after the digit.

All the options are concerned with manipulating the data stored in Genie itself, and selecting option one deals with the address book. The system will print either the name and address only in label format, or all the information, including the phone number and details.

Keyword search

You have the option of limiting the records printed either by range or keyword, and this latter facility is extremely powerful. The keyword can be in any of the address fields, so for example, there is no worry as to whether you put the town name on the second or third line. The search is not case sensitive and the keyword can include wildcards.

In addition to printing, the information can be spooled out to a disc file, thus making the data available for other programs, and as with printing the spooling can be limited by keyword or range.

Information can also be imported into Genie's address book from data stored elsewhere. I wish this had been available earlier. My address file was on another computer, so had to be printed out and then laboriously re-entered. With this facility the data could have been ported over as Ascii and then imported.

It must be in the correct format and PMS wisely warns you to make a backup of your current Genie data using the built-in *GBACKUP command before attempting to import, in case you do something wrong and possibly corrupt your current data.

The manual gives brief details and examples of compatible files – spooled files from Wordwise and Interword, or saved files from View, and data files from Masterfile or Interbase can usually be modified, but you are advised to check with PMS if you have doubts about your own particular files.

The import option can be limited with a Y/N response for each address so control can be exercised over which addresses are inserted into Genie.

Menu option two concerns the notepad, and will either spool or print selected pages, limited either by range or keyword. The keyword can, like the address book, appear anywhere on the page, so for example you can search for and print all note pages that refer to a current business transaction or piece of software.

Desk Diary

The Desk Diary menu option is probably the most important and will print or spool out diary entries for a range of days. There is no option for keyword, which is irrelevant in these circumstances. The entries are printed out in two columns, and if required you can have a space printed for blank diary entries.

A nice feature is that you can have your diary entries printed out as a week planner, and it all fits on to one standard page. Because there are seven days, and the entries are printed out in two columns, there is a convenient space at the bottom right of the page for the program to print the calendar of the appropriate month, with indicators as to which week of entries was being printed.

This option is very useful as the page can be slipped into a folder when attending meetings. The calendar can be printed by itself and will be correct for any day this century.

Menu option four prints or spools the entire phone book from Genie containing surname, first name, and telephone number. The entries are in alphabetical order, and a blank line is printed before each new letter of the alphabet to break the entries down into groups.

The final menu exits the system, and you are warned in the manual not to exit by pressing Break, but to do it correctly by selecting 5+Return.

All in all this is an excellent utilities disc, and makes Genie even more indispensable. Quite superb value for money.

Product: Genie Utilities Disc
Price: £9.95
Supplier: Permanent Memory Systems, 38 Mount Cameron Drive, East Kilbride, Scotland G74 2ES
Tel: 03552 32796

UNTIL now BBC Micro owners have had to accept that with Genie they would have to enter the date each time they wished to use the package – but not any longer.

PMS has launched Genie Watch, a small rom package about the same size as Interword – slightly taller than a normal rom, but it fits into the usual socket – and it adds a real time clock, which maintains the current date and time even when the machine is turned off.

Now when you enter Genie diary it is automatically at the current date. In addition you can have the time displayed in the top right corner of the monitor screen. This is activated by *CLOCK ON and the sheet of information warns that any shadow ram should be turned off. It transpires that this is for Compact only – the program behaves perfectly well with my Watford board.

There was no need for a manual because all the program does is display the time. But it enhances Genie into what I believe is the ultimate accessory for the BBC Micro. Compact owners will be interested to know that an enhanced super-clock is available for them, with countdown timers and alarms.

Product: Genie Watch
Price: £34.95 (£29.95 for registered owners.) Compact version £34.95
Supplier: Permanent Memory Systems, 38 Mount Cameron Drive, East Kilbride, Scotland G74 2ES.
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ADE+ is a 65C00 series assembler system supporting all the mnemonics of the 65C12 used in the latest BBC microcomputers plus the additional 'Rockwell' instructions. ADE+ is fast, faster in fact than the in-built BASIC assembler and all rival products that we have tested. The assembler produces absolute code that can be *RUN or linker modules that can be merged with the output from other programs using the ADE+ linker. ADE+ supports a powerful linker which drastically cuts assembly time; a feature normally only found on minis and mainframes. The linker will even link the output from compilers with your assembly language programs. Full library support for both the linker and the assembler is provided - fast searching for unknown instructions in a random access macro library. ADE+ is a modular system with many modules to add later; i.e. a mouse based editor & a Z80 cross assembler! A print spooling system uses sideways RAM as a print buffer to eliminate waiting time; your listing runs off as a background job! Use the print spooler from BASIC or your own programs. ADE+ uses ALL available memory. With a second processor attached the IO processor spare memory is used as a buffer to reduce the amount of disc access. All available memory is handled by ADE+'s intelligent memory management module. Use your own favourite editor or the one provided. Assemble from disc or memory. Full utilities including librarians, converter for BBC BASIC etc. ADE+ must be *the* bargain of 1988!

A comparison of three 65C12 assemblers

Feature	ADE +	BBC Basic	MACROM
Number of pseudo-ops	64	4	36
Use of all available RAM	Yes	No	No
Macros	Yes	No	Yes
Relocatable output	Yes	No	No
Linker with libraries	Yes	No	No
High level constructs	Yes	Yes	No
Number of error reports	39+warnings	3+BASIC errs	20
65C00 extended opcodes	All	65C 12 only	65C 12 only
Switch of 65 C 12 opcodes	Yes	No	No
ROM size	32K	16K	16K
Disassembler	Yes	No	Yes
Label restrictions	No	Yes	Yes

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Your technical questions answered by MIKE COOK

PROBLEM SOLVED

PC transfer

I WOULD like to be able to transfer Basic programs, data and text files between the two IBM-compatible PCs I have at work and the BBC B at home.

A colleague has suggested that a second processor would make this possible. Can you tell me whether this is the best solution, what problems of limitations I am likely to encounter, and which processor would be most appropriate? – **Dr.David Briggs, Brussels.**

● *No, a second processor is not the way to tackle this problem. The difficulty lies in the way the data is stored on the disc.*

A standard Acorn DFS uses single density 80 or 40 track storage, whereas the IBM PC almost exclusively uses double density. So the first step is to get a Watford DDFS which uses double density.

Next, an Acorn DFS holds the disc catalogue in track zero and saves files as contiguous blocks, but almost every other micro puts the catalogue on a different track, uses a different format and stores files in scattered blocks. So you need some software that can read the IBM PC disc format.

The other option is to get a PC to read an Acorn DFS disc. One such utility I have used with success is Beebos from Microboss (02556 71095) but you still need to write in double density with the DDFS – unless you are using an PC/AT with 360k drive which can read and write single density.

However, once you've done all that you have to bear in mind the internal file formats are still not compatible – although Beebos does have some format conversion utilities as well. But Microsoft Basic is not the same as BBC Basic, no matter how compatible the file structures are.

Reed about it

I HAVE a BBC B and have read every issue of *The Micro User* during the last 12 months, but I can't recall any article dealing with how to use the user port.

To be more specific, I want to control some 5V relays which would switch on various devices – say lamps or motors. I've heard that it is wise to protect sensitive chips in the computer from back EMF using opto-isolators, yet I have never seen this form of protection in any of your project articles.

So could you please direct me to any back issues containing this information or any books you know of? – **M.A. Bridge, Warrington, Cheshire.**

● *The user port has been covered many times since March 1983. Opto-isolators were described in the September 1983 issue and the previous two months were devoted to the user port. Unfortunately Database Publications no longer sells these back issues, but you can often get hold of them through* The Micro User *classified advertisements or the inter-library loan service of your local library.*

The January 1988 issue also had information about connecting up reed relays. However, note that there is an error in Figure II – in order to obtain full protection from back EMF, the anode of the diode should be connected to the collector of the transistor and not the base as shown.

Extra keys

COULD you please tell me if you have ever published a body building course covering an add-on numeric keyboard for the BBC Micro? If so which issue was it in? – **Brian Moulson, High Wycombe, Bucks.**

● *Yes, it was in the July 1985 issue.*

Double trouble

I HAVE an issue 4 BBC Model B 1.2 OS, fitted with Watford 1.53 DDFS, but I am unable to format discs in double density although the computer will read and write in that density.

There are no problems formatting in single density, but I found by pressing IC 87 formatting stopped. I changed both the IC and its socket, but this did not cure the fault.

I have had the disc interface for approximately five months now – it worked perfectly when I first bought it. Can you help me to pinpoint the cause of the fault? I have diagrams of the BBC Micro, and full workshop factsheets. – **C.I. Unwin, BFPO 28.**

● *When you pressed on the chip you probably flexed the printed circuit board. This could do two things: Unseat the ICs from their sockets or open up tiny cracks in the printed circuit board tracks. However, as this pressure only causes faults and doesn't cure them it's not such a good indicator of what's going wrong.*

You say it will not format in double density, but do not say what happens when you try – this will give you a clue to the fault. If the system reads and writes double density data there is likely to be nothing wrong with the data separator and associated components.

The prime candidate is likely to be the disc controller chip. However, if you have facilities for testing, trace the signals from the disc controller chip – on the pins – to the place they are going to on the main board.

Look out for signals that are floating rather than being held at a firm logic level. You can do this by having a 3k pull-up and a 3k pull-down resistor connected to your oscilloscope probe.

Cheap circuits

I WORK in the maintenance engineering department of Ford's Halewood plant and recently my work has involved the design and installation of pneumatic logic systems.

Producing neat circuit diagrams with a pencil and ruler is a time-consuming and potentially frustrating process and I would much prefer to use a simple CAD package. I am aware of two products on the market which would perform the task – Pineapple's Diagram II and Technomatic's Novacad.

However, both of these products provide facilities which I will not need and for which I would prefer not to pay. They would also involve upgrading to disc and this, when added to the cost of the packages themselves, puts the expense out of my range.

My hardware consists of an issue 7 BBC B, Watford shadow ram, Watford rom board with 16k SWR and a Brother M-1009. – **Paul Downes, Anfield, Liverpool.**

● *Look at this from the software producers' point of view: By including lots of features they increase the potential sales market and sell more. This allows them to offer the product at a lower price and be even more competitive.*

A more restricted package would have a smaller market and so would have to sell for a higher price. Compared with equivalent packages on other micros, the ones you mention are cheap and you probably won't be able to do what you want for less.

Bits of bytes

I HAVE been trying to interface my BBC B to a RS232 dumb terminal and have managed to get transmission in both directions. The problem is that the

Turn to Page 64 ▶

◄ *From Page 63*

codes from the terminal are the characters plus 128.

I have tried to change the BBC Micro to 7 bits but have not managed this. The terminal has a parity switch at the rear, with even, odd and none as the options – the none option is the best I have managed.

Also, I tried to write a piece of software to combat this using INSV – the insert to buffer vector – to intercept input from the RS423, and AND it with 127.

This does not work, as the operating system does not appear to indirect input from the RS423 through this vector. Please can you help me? – **Clint Redwood, Romiley, Stockport.**

● *The problem is that the ACIA chip that handles the serial input is reporting a parity error so the operating system is never putting the received data into the buffer. That is why your program appears not to work.*

*The ACIA hardware has to be set up properly to receive the different data format. This can be done with a *FX156,X,227 command, where X is not a variable, but a number corresponding to the data format you want. The following table will give you the value to use:*

X	Data	Parity	Stop bits
0	7	even	2
4	7	odd	2
8	7	even	1
12	7	odd	1
16	8	none	2
20	8	none	1
24	8	even	1
28	8	odd	1

Hot chips

I HAVE a BBC B with Solidisk sideways ram and DDFS. After 30 minutes of use programs including Commstar and Elite crash. In the latter, spurious lines start to appear on the screen, marks appear on the radar and I think additional ships are generated.

Neither a new PSU nor changing most of the chips have helped, and removing the sideways ram and putting a fan on the board simply delays the occurrence. Switching the BBC Micro off and waiting 30 minutes clears the problem. Have you any ideas? – **Dr W.E.J. Leverton, Yelveton, Devon.**

● *Quite simply something is getting too hot. It is likely to be a chip that you haven't changed. However, rather than just carrying on swapping them try to find out which one is going wrong.*

One way to do this is to get a can of freezer from an electrical shop and when the computer hangs up try cooling chips until it comes back to life. By repeating the process several times make sure it is the frozen chip and not just the overall temperature reduction around the area that is doing the trick.

Colour video

IS it at all possible to send a video signal (composite video) from a VCR to a Microvitec Cub RGB monitor. If so, how? – **Mark Barrow, via Prestel.**

● *The only way to get an RGB monitor to display a composite colour video signal*

TAXAN 625
TAXAN HAVE MADE THE BBC A PLEASURE TO WATCH.

Your technical questions answered by MIKE COOK

PROBLEM SOLVED

is to get an adaptor that converts composite video into RGB. These can be obtained at a few specialist video suppliers and cost about £70.

Dead micro

THIS evening I left my BBC B switched on for between two and three hours. When I returned it had apparently frozen so I pressed Break. There was no start-up message so I switched it off, then on again. Out of the speaker came the continuous first note on the start-up tone and the screen was blank.

I hope you can help me – could you please bear in mind that I only have a small knowledge of the internal workings of a BBC Micro. – **Andrew French, Thornbury, Nr. Bristol.**

● *There is no harm in leaving your micro on for long periods – sometimes I leave mine switched on for several days when using long running programs. However, what you have is a dead computer: The problem could be anything from an ill-fitting connector to a damaged chip.*

For a start, take the lid off and make sure all chips are pushed home and also check the cable that connects the keyboard to the main circuit board – that often comes loose.

Other than that, without test equipment it is impossible to say what is wrong so, unfortunately, your only recourse is to take it for repair.

Graphic typewriter

I OWN a BBC B and recently bought an Olympia Carrera electric typewriter. Unknown to me they can be used together so I purchased the appropriate interface box and leads and turned the typewriter into a printer.

There is now just one problem: I would like – if possible – to produce graphics on the typewriter and would like to know if there is any way this could be achieved.

I realise that the daisywheel can only produce letters or numbers but I have heard of such things as type cartridges and typefaces. Is it possible to produce graphics with these? – **Paul Winn, Taunton, Somerset.**

● *You can get extra typefaces for most printers of this type but, unfortunately, the number of individual characters is limited to just over 100.*

If you consider a typical dot matrix character as consisting of an eight by eight matrix you will see it consists of 64 individual dots.

This gives a staggering $1.8x10^{19}$ different pattern combinations possible. You can see that it is impossible to mimic anything like that.

However, you could write some software to give a graphics-like output by selecting characters based on their density. For example, for a bright pixel you choose a low-density character like a full stop. Similarly for darker pixels you choose a dense character like an asterisk.

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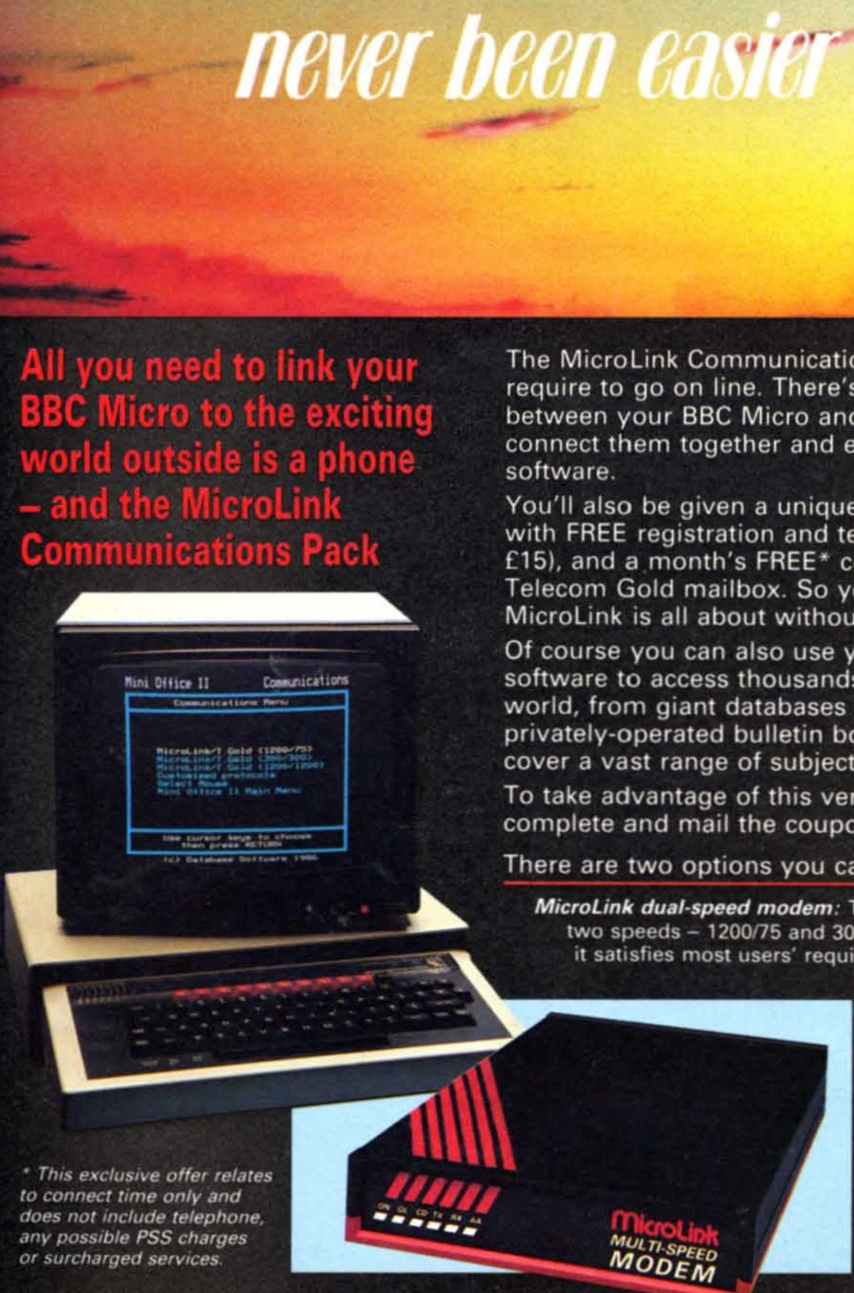
Mini Office II
Communications
Communications Menu
MicroLink/T Gold (1200/75)
MicroLink/T Gold (300/300)
MicroLink/T Gold (1200/1200)
Customised protocols
Select Mouse
Mini Office II Main Menu
Use cursor keys to choose then press RETURN
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Worth that million yet?

Andy Smith tries out a home banking system and is impressed

KEEPING tabs on your money can be a burden today: Most people have current and deposit accounts, credit cards, one or more building society accounts and a mortgage. Within these, many transactions may take place including standing orders, receipts of payments and interest. If you've got a computer, what better way to organise them than with your own Bank Manager?

The Bank Manager is a home accounts program that runs on the native Archimedes computer. Its purpose is to organise your financial transactions and produce detailed reports of the state of your accounts. It comes with a good manual and one 3.5in ADFS disc.

The program has the facility to keep tabs on 36 different accounts – referenced by the letters A-Z and numbers 0-9. These are nominated by you, and it is best to use meaningful references like L for Lloyds, A for Abbey National or V for Visa.

In addition, there is the facility to nominate analysis codes – up to 99 – for items we need to budget for, such as electricity, gas, clothes, car and so on.

These codes can be used very effectively to see what has been spent over any period – from 1 to 365 days – and how it compares with your intended budget.

A single posting can have a split analysis – one cheque to pay two bills – and double-sided single entry is catered for – you can debit your bank account to pay a credit card account. A nice touch is the facility to have accounts in foreign currencies and to translate to sterling during reports.

Standing orders can be actioned for any account, and once entered can be forgotten, as the program will automatically post these as transactions when it is run. The Archimedes' clock/calendar is used to good effect – the date is important to the program as a reference point although you have the option to over-ride the system date.

Repetitive entry is made easier with the ability to define function keys 1 to 10. They can contain any string and control characters may be used as usual, for example | M to represent a Return.

There is a utility called Report Writer which enables you to use a previously defined and saved command file for printing out information from the master accounts. This file is composed of a small vocabulary of commands which may be abbreviated – see Table I.

If you use it correctly your data should remain safe, and backups should be taken regularly. However, in a far from perfect world, there may come a time when your files have not been closed properly or you have exited the program in an incorrect way – thanks to a power cut for example. This instance has been catered for in a routine that will attempt to salvage a bad file.

Access to the main part of the program is password-protected to stop uninvited eyes seeing a complete record of your financial affairs.

Bank Manager will run using a single disc for program and data, but any drive can be nominated as the data drive, and a separate data disc will allow more transactions to be recorded for a given period.

The menus all use the Archimedes simulated Mode 7 to good effect, with clear instructions and logical choices for colour monitors. But anyone with a monochrome monitor will find the program almost impossible to use because of the colour combinations – it would help to have a choice of configuration.

Statistical analysis is shown using an 80 column screen which makes the presentation of figures a lot easier to look at. Most reports give the option to print or view and if you choose the latter, you still get the option to print out afterwards if required.

A readme file on the disc gives very detailed instructions on the enhancements available with the Archimedes version and explains that more 80 column screens will be introduced to the program as it evolves. Contex offers very reasonably priced upgrades for existing owners and also a service to change data from DFS to ADFS 800k format for BBC B owners upgrading to the new machine.

The program does its job well, in a clear and concise manner, comes with a good comprehensive manual and is easy to use. If you're after a program to keep track of your finances you'll find this one ideal.

Product: The Bank Manager.
Price: £25
Supplier: Contex Computing, 15 Woodlands Close, Cople, Bedford MK44 3UE.
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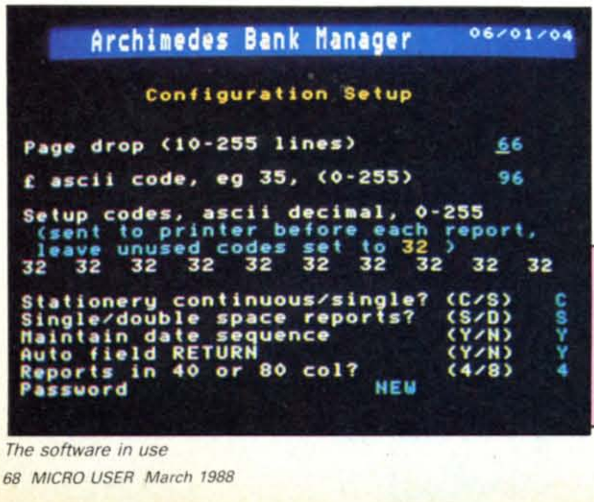

```
Archimedes Bank Manager          06/01/04

        Configuration Setup

Page drop (10-255 lines)             66

£ ascii code, eg 35, (0-255)         96

Setup codes, ascii decimal, 0-255
 (sent to printer before each report,
 leave unused codes set to 32 )
32  32  32  32  32  32  32  32  32  32

Stationery continuous/single? (C/S)   C
Single/double space reports?  (S/D)   S
Maintain date sequence        (Y/N)   Y
Auto field RETURN             (Y/N)   Y
Reports in 40 or 80 col?      (4/8)   4
Password                  NEW
```

The software in use

HEADING <string>	Define page heading
EJECT	Throw a page
TOTAL	Display total of field
DATE	Display current date
ANALYSIS	Print histogram
***string**	Send command to operating system
CONTROL n n n ...	Send command to printer

Table I: Some of the Report Writer commands

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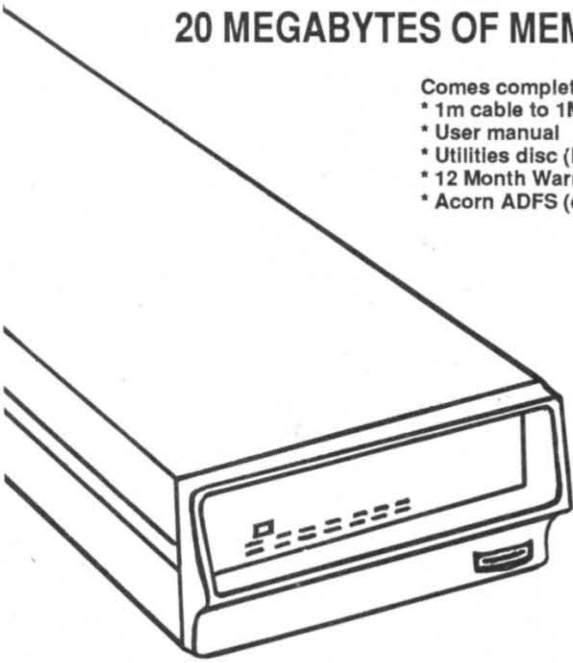

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Biting the baud

Steve Gold explains how data can be transferred between various micros

MENTION communications to most computer users and they immediately think of a micro and modem plugged into a telephone circuit.

But what about plugging one computer into another? Before we take the quantum leap of plugging a BBC Micro into an Acorn Archimedes (assuming you've just upgraded), let's look at the theory behind the practice.

The printed text you're reading on this page originates – believe it or not – from a Z88 micro being used on an Intercity 125. As text is entered into the computer it's represented by bytes of data held in the machine's ram.

We know that this data can be saved to tape or disc by sequentially recording – that is, saving each data bit one after the other – on to the magnetic medium concerned. Replaying the tape or disc results in the data bitstream being pumped – one bit at a time – back into the micro's memory.

Fine so far. But, what happens when we attempt to replay our tape or disc into another machine? Providing it's another BBC Micro – or even an Electron – it will load and, subject to hardware limitations, run.

But what if the other micro is a Commodore 64? Unless you've done some nifty programming, the chances are that your efforts will be in vain. So what went wrong?

For theoretical purposes, let's look at a project involving linking a BBC B to an Archimedes. We know that, courtesy of Acorn's excellent design team, it is capable of reading programs and data saved from another Acorn micro. If we're really lucky, the played-back program might even run!

But hold on a minute. The Archimedes has no tape port, and its disc system is different from the BBC B's. How can we move 8 bit data between the two machines?

As with most solutions in the communications vein, the answer is to link the two machine's serial ports. Figure I details the exact connections, from which we see that they differ radically from those linking a BBC Micro (or an Archimedes for that matter) to a normal modem.

The cable involved is called a null modem and – broadly speaking – each end of the link is a mirror image of the other end. Null modems are extremely easy to make and most good computer dealers will make one up for you on request.

So we've linked up our BBC Micro and Archimedes' serial ports. What now? If the file to transfer between the two machines was short and simple, we could open a channel from the BBC Micro's keyboard or disc drive and pipe data through the RS423. At the other end, data could be read in from the Archimedes' serial port and saved directly to disc.

Ah, if things were that simple. There are, as many Archimedes owners will already know, a number of documented bugs in the Archimedes hardware – at least two involving the handshaking (the ability to handle data interchange) on the Archimedes' RS232 port. The problem usually manifests itself with the Archimedes being unable to cope with large quantities of data coming in at high

Xmodem to the rescue

The solution to our problem lies in an error-checked method of file transfer. All error-checked file transfer protocols involve splitting up the data to be sent into several small blocks of bytes. The pure numeric value of each block is calculated by addition and a checksum figure appended to it.

As each block is sent over a data link, it is stored temporarily and the checksum calculated. If this agrees with the figure appended to the block, all is presumed well and the data may be saved to tape, disc or used immediately.

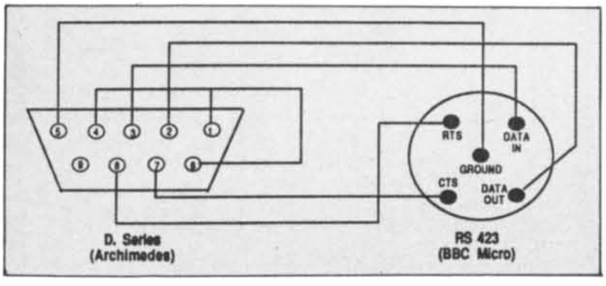

Figure II: BBC Micro RS423 to Archimedes RS232

Checksumming data to verify its integrity was used on the earliest computers when data was saved to tape or magnetic wire (discs were not invented in those days). It took until the late 1960s, however, before the idea of checksumming was applied to data sent over a modem and/or serial link.

The most popular error-checking file transfer protocol used in communications today is the Christenson protocol, named after its inventor Ward Christenson. Nowadays, most people refer to it under one of its generic titles – Xmodem, Modem7 or CP/M protocols.

Most users of Acorn micros tend to use the term Xmodem when talking about the Christenson protocol, so we'll do likewise. Under Xmodem, each block of data is 128 bytes long and the checksum value is calculated by adding together the Ascii values of the bytes in the block.

Other file transfer protocols

Xmodem is a very simple principle and very easy – if somewhat lengthy – procedure to implement from BBC Basic. Most communications programs available today have Xmodem in their list of available file transfer protocols.

As the mathematicians among *The Micro User* readership will probably have realised, XModem uses a relatively crude checksumming system on its 128 byte blocks. Two or more bursts of extraneous noise on the circuit over which data is being transmitted can result in checksum errors which cancel each other out. This cancelling out is known as a compensating error situation.

For our simple serial port link, Xmodem is very unlikely to encounter any direct data errors which could be caused by external electrical and/or magnetic fields, so it is suitable.

Over a modem link however, the possibility of compensating checksum errors increases so, programming nature being what it is, many Xmodem users have chosen to modify Ward Christenson's protocol and even write their own error-checking protocol.

Variants on the theme are many, and include such names as Ymodem, Zmodem, Compuserve A, Compuserve B, Tlink, Sealink, Telink and Vlink, to

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◀ *From Page 71*

mention but a few. For most practical purposes however, Xmodem and its forerunner – which was called Kermit – should suffice to service most communications users' needs.

The latest versions of Kermit – known as SuperKermit – implements features such as variable-size data blocks and sliding window techniques.

The latter has nothing to do with those used in a desktop programming environment. The term refers to a variable-size data window which allows the block sender to *send ahead* a number of blocks, while the distant computer is calculating the checksums on its received data.

If a bad block – one on which the checksum does not agree – is received at the distant end, sliding window Kermit allows the sending computer to slot in a re-send of the bad block at predetermined points in the data transmission.

But back to our BBC Micro-to-Archimedes link. If a communications program is installed on both machines, and a null modem cable is connected between the serial ports, communications can quickly be established. Once a direct keyboard to keyboard link is achieved, both micros can switch into send and receive modes respectively.

For our application both machines will probably be in the same room, but for all practical purposes they can be as far apart as electrically possible. In the case of our BBC Micro-Archimedes link the limit is about 50 feet, as imposed by the BBC Micro's RS423 line voltage.

As a slight digression, a fried of mine linked two BBC Bs at each end of his house by slinging an RS232 cable over the roof. Since each room was on the ground floor and the house was three storeys high, the link was almost 150 feet.

Amazingly, it worked at 9600 baud (9600 bits per second) on the day, although the next morning it failed to work faster than 4800 baud.

The reason for this was that, overnight, temperatures dropped below freezing, cooling the cable considerably. As the temperature fell the impedance increased and the line voltage – and current – dropped. On a cold morning the cable did not conduct the serial output signal as well as it did the evening before.

That just about concludes our practical application and explanation of error-correcting protocols for this month, but before I leave you – and you turn the page – a few hints and tips:

● When linking two devices by their serial ports, it is perfectly possible for what is known as garbage characters to appear on the screen in place of a the Ascii characters sent. If this happens when linking your BBC Micro to an Archimedes, it does at least mean that an electrical link has been established between the two machines.

If the garbage characters received are substantially more than the number sent by the other machine, it almost certainly means the receiving station is set to a lower baud rate than the sending station.

Conversely, if the number of garbage characters received is less than those sent, the receiving station is probably set to too high a baud rate.

If baud rates are equal between the two machines, you should check the parity. Most inter-computer links work best using an 8 bit, no parity, one stop bit (8-N-1) data transfer rate. Avoid using seven bits if possible, as this can cause problems when moving 8 bit files between the two machines.

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just yet but in some way or another this won't be the last you hear of me – Repton, the movie, perhaps? You'll have to wait and see. Anyway, I'm glad you had such a good time at your fancy dress competition and thanks for the letter.

Repton for Archie?

I'm considering buying an Archimedes but don't know how many games will be available. Could you let me know if any Repton games will be brought out for this fantastic machine? – **Mr.F.Johnson, Herts.**

● It's a possibility – but I'm not prepared to commit myself just yet. The Archimedes has caused quite a stir, and whether it's Repton games or not, Superior Software has promised to support it. You can't say fairer than that.

Master version

I have a Master 128 and am about to buy Life of Repton. *Is there any difference between the BBC B and Master version?* – **Mrs.D.Hopkins, Leeds.**

● The Master version is special because both the editor and the game load into memory on the Master, and you can flip between them by pressing the Break key – which saves a lot of time.

Repton shuffle

I bought Repton 3 more than six months ago and have spent many agonising – but enjoyable – hours trying to complete it. However, I've come a cropper and I just don't seem to able to finish. Somebody has mentioned that I should do the Repton shuffle – I still haven't completed the game but I've been banned from the local nightclub. Please could you enlighten me? – **J. Stone, Sale.**

● The Repton shuggle was first needed for screen j of Repton 1. I can hold a rock on my head, but if I move down I get knocked out by the falling rock. But if I move to the left and then swiftly back to the right – or vice-versa – I can push the rock to the right-hand side before it falls any further. Here's a diagram of how it's done:

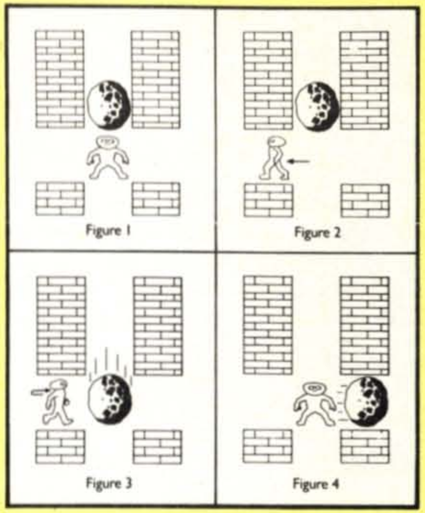

Figure 1

Figure 2

Figure 3

Figure 4

Fatal for spirits

I find it infuriating that spirits can sometimes get dazed and just go round and round in circles. Is there anything you can do about this if it happens? I am getting very frustrated. – **Dr.George Riley, Scunthorpe.**

● Please calm down – sometimes you can get a spirit moving by dropping another rock on it or allowing fungus to grow until it touches the spirit. However, this condition is usually fatal – but if you get the screen solution right this should never happen.

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AGONY UNCLE REPTON
REPTON WRITES

Repton writes...

Hi! Repton here,

How are you, Reptonians? Recovered from last year's summer holiday Around the World *yet? Come to think of it, it wasn't much of a holiday was it? I hardly had a moment to relax.*

Which corner of the globe did you enjoy the most? The Arctic? Not for me, it's far too cold and those igloos don't have central heating, you know. I enjoy a warmer climate like Africa, but it plays havoc with my scales – I got a touch of sunburn out there and my scales started to peel. I did get a lovely tan though, the only trouble is it makes me look like a hippo!

I got a letter from Cliff Michelmore the other week, pleading with me to join him on Holiday '88 as a travel consultant but it's not my scene, and all that foreign food gives me indigestion. Besides which, I'm far too busy being an international megastar to be jetting off around the world again.

Have you tried my latest adventure The Life of Repton *yet? You may have already had a copy from Santa. I bumped into him up in the Arctic and told him what an ideal Christmas present it would make, but if he couldn't get hold of enough copies for everybody I guess you'll have to go buy it for yourself.*

If you've already got a copy and are a bit concerned, don't worry, I'm not an OAP yet, that was just a clever use of the crystal ball – there's still life in the lizard yet.

This wonderful comic is especially for you, Repton fans. It's packed with everything you've always wanted to know, whether you're just starting out or an expert. For the beginners there is Getting Started, and for the more experienced Reptonians, previously unpublished Repton 3 screens. For everybody to enjoy there's my superb editor competition – designed by modest little me. It's easy to follow and should make you a dab hand with the editor. As Agony Uncle Repton, I answer many of the queries you have written in with.

Well, I can't hang around here chatting all day, I've lot's more places to visit and screens to design. If you want to write to me you can do so c/o Superior Software – they'll pass the letters on, they're such nice people – and I'll be only too glad to help.

See you soon

Yours

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	5	2							2	6	2	6	1	18	1	3	3	3	6	3			1	3	3	1
2	3	1				1			3	2	2		3		3		6	3	3	3	6	3	3	3	3	2
3		13	14	2		3			8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	3	
4		20	22	2	3				8		3	3	3			24	8	28	8	2	2	2	2	8	1	
5		3	3	3	3	3	1	1	8		8	8	8	8	6		8	2	8	2	1	2	6	8	3	
6	8	8		2	13	11	14	24			8	32	32	8		29	8	2	8	2	3	2	2	8	3	
7	30	12		2	16	9	22				8			23		8	8		8	1	1	8	8	8		25
8	2	16	32		2						8	8	8	8		8				3	3					3
9	2	10	18	1	1	1		25				2	2	8		8	8	8	8	8	8	8	8	8	8	8
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11	8	8	8	8	8	8	8	8	14	2	2		3				2	2	6	2	6	8	2	1		
12			1	8	31						8	8	8	8	8	8	8	2	2	2	2	8	3	13	14	
13		8	23	3	18	21	10	12			8	2	2	2	1	8	8	8	8	8	8	8		20	22	2
14		8	23	3	8	2	2	2			8	6	6	3	2	10	2	2	2							
15		8	23	3		2		8	6							2	18	17	16	8	8	8	21	16	17	18
16		8	23	3	2	2	2	8	8	T							1	6			1		2			
17	3	3	23	3		17	16	18	23	8	14	2	1	6				1	3	3	3	3	3	2	2	2
18				8					1		8		13	11	11	11	11	14	3		3	23	23	23		
19	3	3	8	8	8	8	8		23		8		17	21	12	10	16	22			3	23	2	23		
20	6	2		2	17	2	12				8	2			3	1	3					17	21	16		1
21	6	2	6				8		8	5	8	25	6			5			21		8	27	27	27		3
22	2	2	2	18	10	17	8	23	8	2	8	3	3		2				17	2	12	27	27	27	27	27

Getting started

THERE may be two reasons why you haven't yet completed the first screen of Repton 3, either you haven't bought the game and your friends won't let you borrow it – I wouldn't let my friends borrow mine, it's far too much fun to play – or you haven't got the necessary patience, skill and super-intelligence of my good self.

Well, for whatever reason it is, being a kind and generous reptile, here is some help. I can't teach you patience or intelligence – but I can teach you some tricks of the trade. Although don't think I'm a pushover and will release all the other solutions – you can work those out for yourself.

What I've got for you here is the solution to the first Repton 3 screen. All the instructions are from your viewpoint, so *go left* means to

Agony Uncle Repton

THIS is Agony Uncle Repton here, lending a sympathetic ear to any of your reptilian problems.

Dear Uncle Repton, I would like to nominate myself for the Repton Fan of the Year. *Since I bought the Superior Collection Volume I, which included the original Repton, I've been totally hooked. I have purchased every Repton game out and hope to see lots more.*

The other week at school we had a fancy dress competition, I went as Repton and my best friend went as Commander Stryker. It was great fun. Please, please, please (grovel, grovel) let's have some more Repton games – I don't know if I can live without you. – **Tommy (aged 12), Glasgow.**

● It's very encouraging to know you're so enthusiastic about my games. As for the *Fan of the Year* award, we haven't started that competition, but if we ever do you'll be the first nomination.

More screens? I can't promise anything

Competition

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- **2nd prize – 5 games of your choice**
- **3rd prize – 3 games of your choice**
- **25 runner-ups of 1 game**

To win this fun competition just follow these simple instructions:

● Load up the Repton screen editor and select the television symbol at the top right.

● The centre screen area is cleared and the 32 standard Repton game icons appear in two rows at the bottom of the screen.

● We'll assume that these icons are numbered from 1 to 32, left to right and top to bottom.

● Alongside you can see a Repton 3 screen with each square numbered to represent one of the icons. The letter T, on the competition screen, denotes the destination of the transporter.

● Set the timer to 1200.

● After building the screen, save it and play it. The object of the competition is to find out where all the rocks will finish up.

● Don't disturb any rocks that are not necessary to complete the screen.

● And make sure you stop the fungus growing as quickly as possible.

When you've completed the screen and you've got the solution correct, work out the coordinates of each rock – F3, J9, T14 and so on – then send the answer with your name and address, on a postcard only, to:

Repton screen competition, Micro User, Database Publications, Europa House, Adlington Park, Adlington, Macclesfield, SK10 5NP.

Closing date March 31, 1988

Problems solved

● **Timer:** The time is entered by selecting icon 12, as shown on your instruction leaflets, and then the pull-down menu headed maps. The time counts down from a maximum of 9999.

Whenever a time capsule is consumed the clock is reset to its starting figure. There is no defined minimum time limit, but it is unlikely that a screen will be completed in under 500, which lasts for approximately 35 seconds before the screen starts flashing.

● **The Edit code:** Once you have completed a screen, you are given the edit code. This is asked for if you want to make any alterations to existing screens.

However, you can also use the editor to design totally new screens of your own. All you have to do is create your screen and alter the icons then save it on your own disc – you don't need to load in a ready-made screen to get started.

● **Passwords:** To give your screen a password, select icon 10 and then the maps menu. Choose which screen (A-H) to give the password to then save it using icon 13. And that's all there is to it.

your left as you are facing the screen, not to my left as I face you.

● Move upwards and left, to the far side of the rock sitting on the safe. Go down and collect, from below the earth, the two diamonds in the bottom corner.

● Return to the starting position and move straight up to the safe and two rocks. Push the first rock behind the safe, step back to let the second rock fall on to the safe then push the second rock over the first.

● Proceed upwards following the path to the right, then continue upwards as far as possible. Go down into the cavern and collect the diamond in the bottom left-hand corner. Move towards the middle and collect the two diamonds on the left of the row of four.

● Move back out of the way and allow the egg to fall and crack open. When the monster hatches the rock on the diamond to the right will fall and kill it. Collect the other two diamonds and the key pushing the rock to the left so you can escape.

● Collect the other remaining diamonds above – all the safes turned into diamonds when you took the key.

● Proceed towards the cavern underneath and clear the earth and diamonds surrounding the cages. Collect the other diamonds in the cavern, but be careful, the bottom diamond under the rock will release the spirits – which are deadly to me.

● You can predict where the spirits will go because they always follow the left hand wall or object. They turn into diamonds when they reach the cages. Collect the diamond previously trapped by the spirits.

● Return to the starting position via the cages cavern, collecting the newly created diamonds on the way.

● Collect the diamonds in the bottom alcoves. Being very careful not to remove unnecessary earth which will allow rocks to fall and trap the diamonds in with rocks.

● To reach the diamond in the bottom left-hand corner of the screen, you must go behind the rock on the edge above and push it to the right, otherwise when you remove the earth and travel down it will fall and kill you.

● Return to the starting position then move upwards on the left-hand side of the screen. Go round the U-bend, collecting diamonds, and continue upwards until you reach the top where a rock will be blocking your path.

● Push the rock to the right and start collecting the diamonds. Move quickly underneath and allow the egg to fall and hatch. Turn and push the rock left to kill the monster.

● Go round the wall, into the cavern below. Collect the two diamonds and move sideways so that the rock falls. Push the rock two spaces to your right. Move down the right-hand wall.

● When you have cleared the earth supporting the two rocks move back up and allow them to fall. Collect the other diamonds without removing the earth holding the rocks.

● Return to the starting position and go right. Collect the diamonds in the bottom alcove. Move upwards and collect the diamond above allowing the rock to fall. Collect the diamond behind it and then clear the alcove downwards to reach a further diamond and a crown.

● Go back up and collect the diamonds clockwise around the central rockery. When you collect the diamond holding the rock up, push the rock down the alcove, otherwise it will drop on you.

● Move downwards into the bottom right-hand corner of your screen collecting any diamonds you can see. Pass under the time bomb and into the bottom chamber.

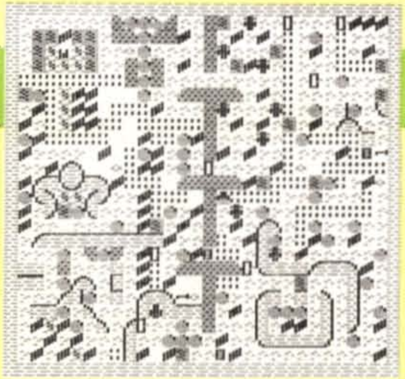
● Collect the bottom right diamond then move along the bottom collecting four more. Remove the earth from beneath the rocks, stepping aside to allow them to fall. Collect the final diamond and return to and enter the time bomb.

Well done, only 103 screens to go! Good luck, Repton fans.

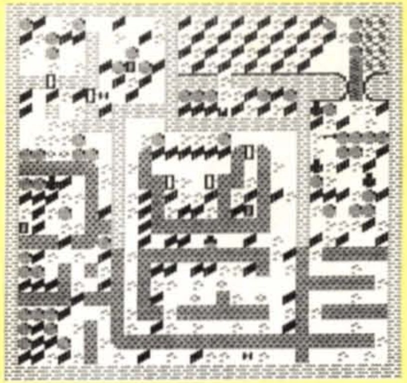
Hidden screens

Just to make things more difficult for you the last three screens in every group of eight are hidden – the map does not appear when you press M.

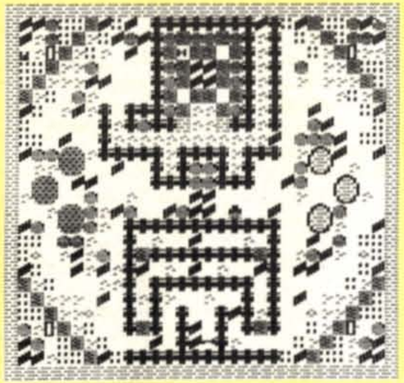
So, as a special exclusive, here are all nine hidden screens from the first Repton 3 collection.



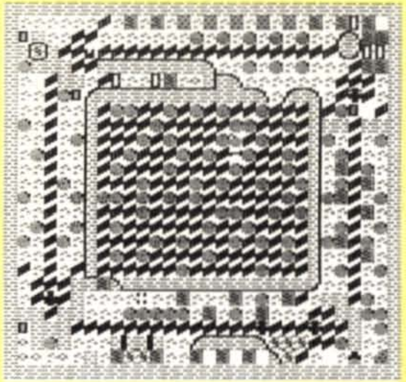
FINALE, Screen F



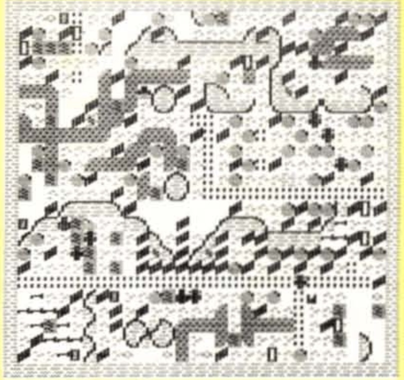
PRELUDE, Screen F



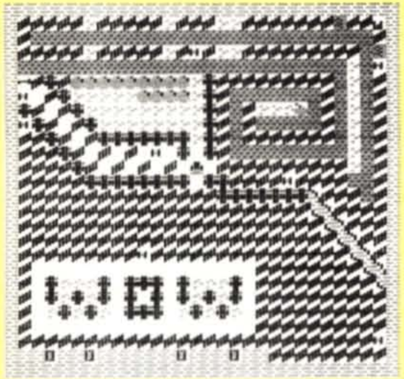
PRELUDE, Screen G



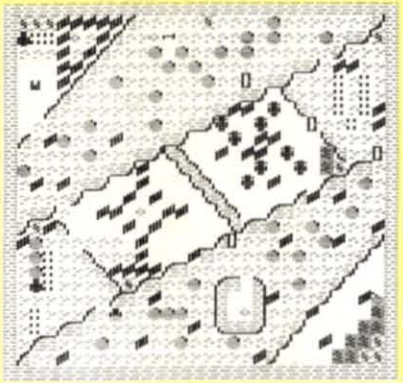
PRELUDE, Screen H



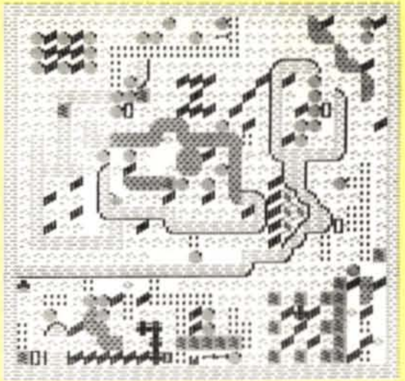
FINALE, Screen G



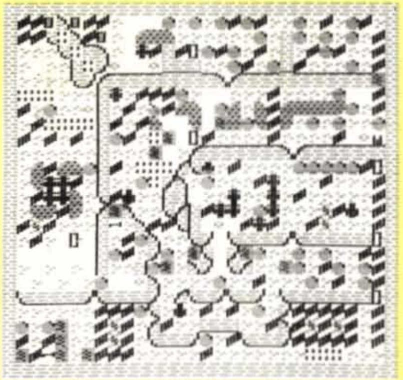
TOCCATA, Screen F



TOCCATA, Screen G



TOCCATA, Screen H



FINALE, Screen H

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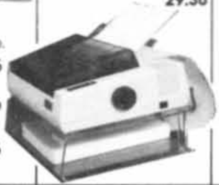

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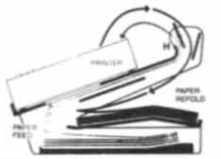

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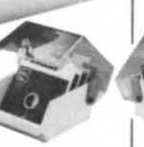

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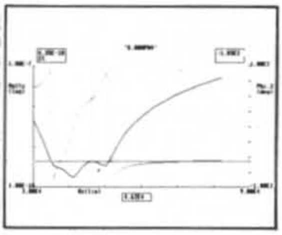

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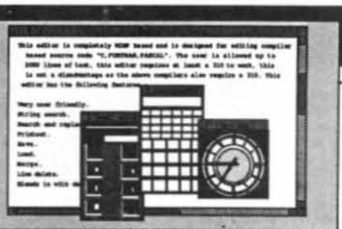

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EDITOR, This is an optional facility for editing source text files for compilers (FORTRAN, C, PASCAL etc), to work it must be used on at least a 310 (this is not a disadvantage as none of the compilers are able to work on a 305). This advanced program blends fully into the desktop enviroment, and is very user friendly and intuitive in its use, the maximum text size is 2000 lines. The files produced are compatible with twin, it is entirely WIMP driven and needs no control/function keys.

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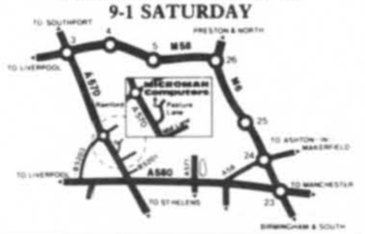

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Taking help a step further

A RANGE of easy-to-use software for the physically handicapped has been released by Scetlander (041-357 1659).

The three programs for the BBC Master – Electra Pen, CAD Master and Storybook – are described as a serious attempt to get away from the Noddy-type software that is generally available for the disabled.

Electra Pen is an art and painting package capable of producing drawings easily and quickly by using either trackerball, keyboard or a system of switches. Features include colour fill, spray gun, ellipses, and a choice of pen nib sizes.

CAD Master has all the facilities of Electra Pen, but also includes a library of graphics such as trees, fences, hedges and border shapes. A selection of predefined building blocks is included for the user to produce windows and buildings via a concept similar to Lego.

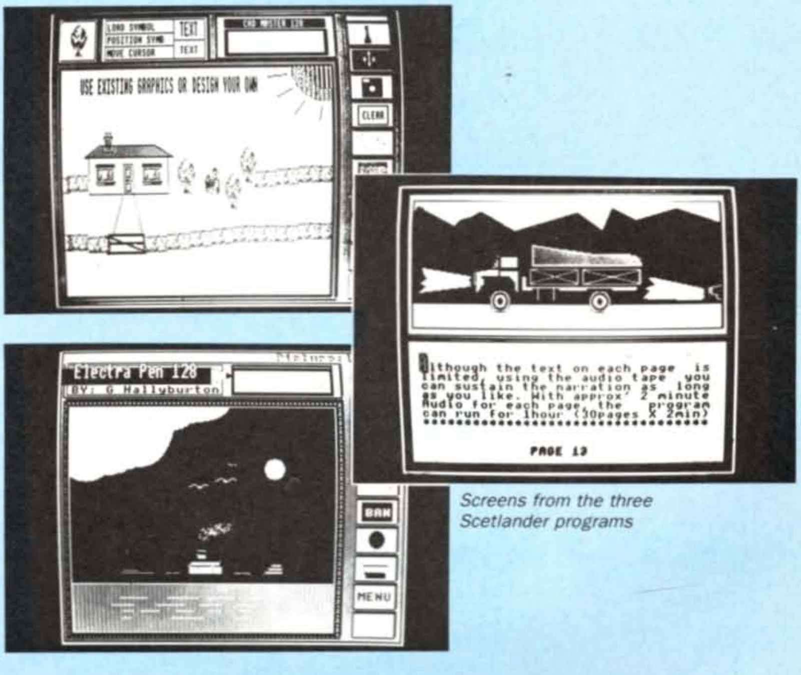
One interesting feature of both Electra Pen and CAD Master is an optional speech synthesiser which audibly guides the user through each function of the program.

The final package, Storybook, is a utility for teachers to produce books on screen for use by the disabled.

It comes on two double-sided discs and boots up automatically. All that is required of the teacher, once a story with graphics has been produced, is for the disc to be loaded.

By simply pressing a switch, pages can be turned and reviewed at any speed. It is also possible to synchronise the program with a one-hour audio tape.

The story appears on a split screen with the graphics at the top and text underneath. Because the teacher produces the computer-based book it is possible to tailor the finished product to an individual's needs. Prices £27.50, £22.50 and £25 respectively.



Although the text on each page is limited, using the audio tape you can sustain the narration as long as you like. With approx' 2 minute Audio for each page, the program can run for 1hour (30pages X 2min)

PAGE 13

Screens from the three Scetlander programs

Dictionary for children

AS part of the Viewbook educational software range, Information Education has released the Viewbook Oxford Children's Dictionary.

The program for the BBC Micro comes on five discs and contains a total of 12,000 headwords and 150,000 words in the definitions section.

Information Education (0782 281643) says that the package has been designed for children in the 8 to 13-year-old age bracket to encourage them to look up and use new words. Price £35.

New line in characters

A UTILITY program for use with Wordwise and Wordwise Plus on the BBC Micro – Euroword – has been released by Charm Micro Soft (0772 616705).

The package, which comes on either a 5.25in or 3.5in disc, allows the user to produce accented and other European characters which can be displayed on-screen in preview mode.

Other features include underlining, function key strips, overprinting for additional accents and printer customisation.

The program provides a minimum of 26 European characters which are then broken down into five sets – French/Italian, German, Nordic 1, Nordic 2, and Spanish.

Output can be to either Epson-compatible dot matrix printers or daisywheel machines with the appropriate print wheel. Price £9.50 for 5.25in discs, £11 for 3.5in discs.

Mini Office II in Holland

STUDENTS at the International School of Eindhoven in Holland are working towards their O levels in mathematics and computer studies with the help of Mini Office II.

While on holiday in England the school's physics teacher, Jan Koks, bought a single rom version for the computer department to experiment with. After an enthusiastic reception from students and teachers a further 13 packages were ordered.

Head of the mathematics and computing studies department – Patricia Everid – said: "Mini Office II is an extremely good package for our students. It is easy to use and also gives them an idea of linking database, spreadsheet, and word processing packages together".

Currently the school has 14 BBC Master 128s and two BBC Bs which are in full time use.

The maths and computing course, which covers all aspects of information technology and programming, lasts for three years and is based on the same syllabus as taught in London.

"Mini Office II has fitted in perfectly with the course", said Patricia. "For the price and features it really is an excellent package".

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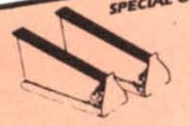

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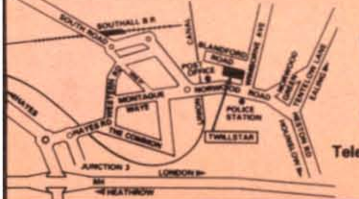

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Read all about it

How Marshal Anderson successfully survived his school's Newsday project

A NEWSDAY is a project in which children produce their own newspaper in a day, working to deadlines, making editorial decisions, setting out pages and generally behaving like media people.

Having decided to go for this project our first need was to get together the necessary equipment. Setting this sort of thing up can be overawing, but we broke it down into two areas: Getting the news and printing it out.

First we would need that day's newspapers, then access to radios – especially one capable of getting World Service for its extensive news coverage. We would also need a computer linked to TTNS from which we hoped to get the bulk of our stories.

To this we added the school's two televisions which we had recently upgraded to include Teletext. We also got in touch with the local press to arrange for any major local story that should break – note the jargon – that day to be passed to us by phone.

For printing out the paper we used Typesetter from Sherston Software, as it seemed to be the right sort of level for 11 and 12 year-olds to cope with. Once set on the screen the page could be turned into either a Banda master or photocopied.

The Banda seemed a good idea because it was cheap and we would be able to use colour. Unfortunately, this option was ruled out by the fact that the pressure rollers of our printer – an Epson LX86 – put two lines down the centre of the master copy and we could find no way to overcome this. Photocopying was our only other option.

Now we had to prepare the children. A group was chosen to run the Typesetter software and given time on it. Others were practicing making up stories from several information sources while still others looked at how a newspaper was set out – different pages for different topics, headlines, how the most important stories were chosen and so on.

We also had yet others preparing features in advance.

Come the day, then, we would have our journalists waiting for the news to come in, news editors and sports editors eager to vet the stories, our typesetters poised to type them and several features ready to go.

We were equipped with several extra borrowed computers, two teachers released for the day – GRIST and shuffled classes – help from parents and an advisory teacher.

All this sounds difficult to organise, but given enough lead time it's all fairly straightforward. We had also arranged for a local newsagent to sell the papers from 4.30pm onwards – this gave us our deadline.

Finally the day dawned. Our main problem was space: Children were spread over quite an area with their TVs, radios and computers, so the first thing to break down was communication.

The editorial team shut itself in a classroom and sulked, mainly because, sad news though it was, the death of Eamon Andrews hardly seemed world-shattering. And they also discovered that if they short-circuited the system and gave their stories direct to the typesetters no one would veto what they had written. Until, that is, the typesetters started running out of space and began making their own minds up.

We really should have put the editors and typesetters together so that some coherence could have been introduced. This was confirmed by our sports editor, who took matters into her own hands and sat with the typesetters telling them exactly what she wanted, producing the best pages in the paper.

Things went fairly smoothly, with stories being taken off Teletext and hawked around the spaces available. Then an Iranian supertanker was hit by an Iraqi warplane at about the same time as a group of children arrived back from the local shops with their opinion poll on the army bullying case.

This seemed to concentrate everyone's minds – decisions now really had to be taken. A TTNS input on the Arab League summit was retrieved to go with the attack news, a leader also needed to be added about the army thing and this meant, with an eye to the clock, some things just had to go.

Once that had been sorted and we

Turn to Page 84 ►

Bradwell Times 15p
Three Die In Arson attack
Star Dies
Iranian Tanker Bombed
Army Bullying
School Crossword
STAR WORDSERCH
Caine Says No!
Killer Blankets
Points Of View
Howards Way
Going Live
Top Ten Singles
Dolphin Dies In Gulf

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were all dashing about trying not to think about our missed lunches, a new problem became apparent. The typesetters were asking what numbers they should put on their pages. This was a problem as we had not planned an exact number, simply aimed at about 10, and naturally the first to be finished were features and sports which went at the back of the paper. The solution was, however, simple: We abandoned page numbers.

We worked on the principal that if there were enough worthwhile stories to fill a page then we would make that page. This was one place where teachers really had to take control because, as soon as a typesetting team had finished one page they just started another. By early afternoon we had three half-finished pages and not the time to complete all of them. At this point decisions became fairly arbitrary.

Up to now the only real technical problem had been with a printer which had caused a temporary bottle neck, but now real disaster threatened – the photocopier was not a happy machine and was flashing its *replace master* light.

This was not really a problem in itself – the man was called to come and do it and the copies were still fine – it could wait. But then we ran out of toner and the calls became quite frantic. Fortunately the repair service was fairly swift and we breathed again, thankful for leasing agreements.

The final problem was totally unexpected. We were all rushing about, feeling quite pleased with ourselves – it was 4.15pm and we had the last pages ready for copying, when the newsagent rang: Who was responsible for this newspaper thing and why hadn't it arrived?

Apparently his fairly small shop was awash with quite large children coming to buy it and we reckoned about half an hour before we'd be ready. When I got to the shop I found the now ejected children spilling out into the road and tried everything from community singing to death threats until the paper – now nine pages long – finally arrived and was instantly sold out.

So what was its value? The children – more than 30 of them – had been in a high-pressure, activity with a very tangible product at the end. The group dynamics gave them severe lessons in how to get on with others, or, in some cases, not.

Language work obviously came top in academic skills and using the typesetting software was a useful experience and a very real use of computers as a tool. The staff as a whole saw a clear justification for using computers and the parents saw the result of their fund raising to buy the machines.

Next time we would organise the space differently, spend more time developing the skills of preparing written work from several sources – much that went in this time was verbatim – and perhaps develop note-taking as we lost most of what came over the radio.

A very interesting point, however, is that very little of what we used came from TTNS: Teletext was the most fruitful source, and therefore schools without TTNS could quite happily undertake this sort of thing at any time – we certainly felt it was well worth the effort and we'll be at it again in March – so hold the front page!

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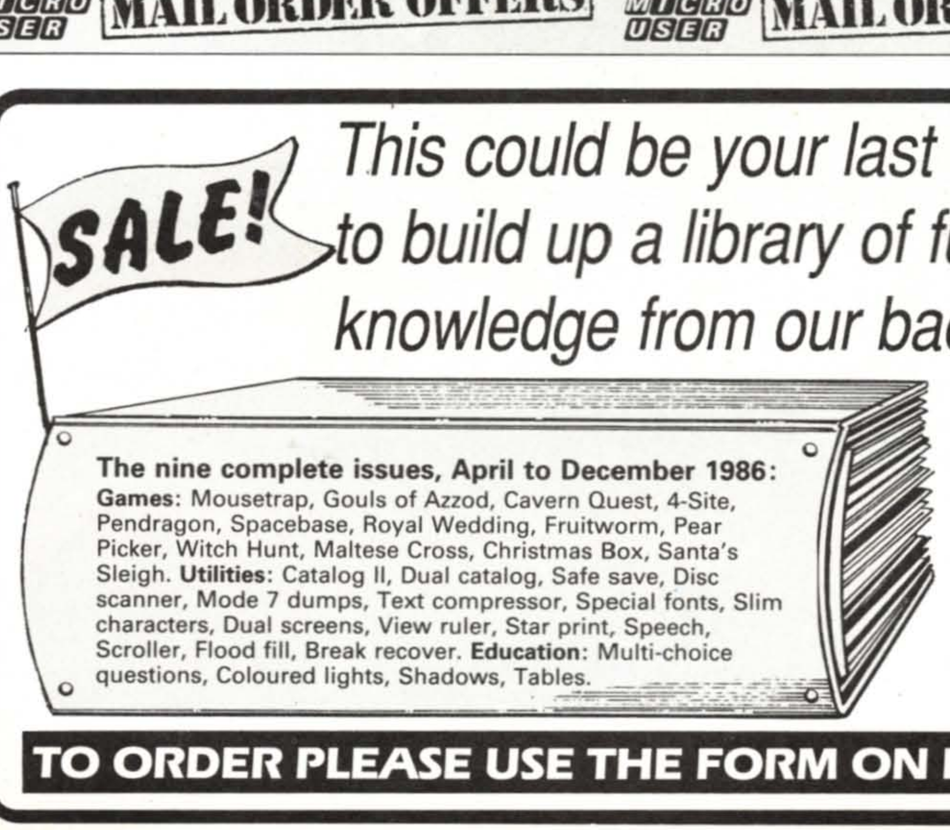

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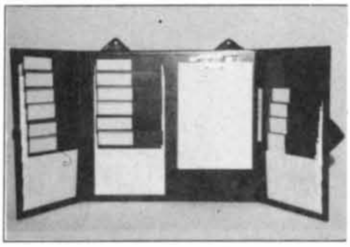

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CEEFAX Guide

Software is currently transmitted for a period of one week. The teachers' notes for the TV series Issues *are transmitted from Wednesday to the following Tuesday and all other files are updated on Fridays. There will be periods during the update day when the files are unavailable. The program details given are provisional.*

February 5 to 11

T/OSB13
B/OSB13

Osbits is a weekly series to help you understand assembler language. Part 13 takes a detailed look at multiplication, where the numbers being multiplied are both several bytes long – a process known as multi-precision arithmetic.

T/SWR15
Sounds

The sideways ram programming series continues with a look at multiple command interpreters – the method of allowing a SWR program to respond to any of a series of different star commands. The multiple command interpreter should accept commands shortened with a dot, and/or prefixed with an optional character.

Logic
L/info

Use your micro to design electronic circuits. Logic allows you to create logic circuits on screen, then save them to disc or print them out on an Epson-compatible printer.

Lister1
Lister2
Lister3
Instruc
File

Basic programs listed on a printer can be difficult to follow. Using LISTO 7 can improve their legibility, but it is still often difficult to find specific procedures or functions. Lister will solve all the problems by producing a very easy to read printout, with all procedures and functions clearly identified, and multi-statement lines separated.

Wampus

Explore the labyrinth and track down the Wampus in this classic game from the October 1984 issue of *The Micro User*.

February 12 to 18

T/OSB13
B/OSB13

A repeat of last week's Osbits module for the benefit of schools enjoying their half-term break.

T/SWR16
Help
Trace

More from the series explaining how to make use of sideways ram. When a multiple command interpreter is used in a SWR utility, it is easy to forget the exact syntax of all the new commands. It is often useful for a SWR program to respond to the *HELP command by explaining the format of its new commands. The multiple command interpreter is introduced in this module.

Grabber
GrabInf

Enter a selection of Ceefax page numbers and Grabber will find and save them all – including any rolling sub-pages. You can browse through the chosen pages at your leisure, or print them out if required.

BackUp
I/Back

A rapid disc backup utility for use with a Master 128. Great time savings can be achieved for owners of single disc drives, with an 80 track DFS disc being copied in under two minutes involving just four disc swaps.

Dual

A two-player game from the November 1984 issue of *The Micro User*. It's high-packed action will keep you enthralled for hours.

February 19 to 25

T/OSB14
B/OSB14

Continuing the Osbits guide to the BBC Micro assembler. Part 14 studies the process of division in assembler language converting binary numbers to their Ascii representation by way of example.

T/SWR17
NoBasic

The rom images created in earlier modules of the sideways ram programming course have all been service roms. Language roms are introduced in module 17 with the example language NoBasic.

MyRom
RomInfo

A rom image of a screen-to-printer routine for the BBC Master 128 computer. When you load it into sideways ram area, you will have instant access to screen dump routines – either text-only for most types of printer or full graphic routines for Epson-compatible printers. The printout produced is of the full screen with correct aspect ratio.

Intro
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Game
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Prog
Title

One of the best, and most famous, computer games is Space Invaders. Here is your chance to re-capture the fun and excitement of this classic game. Can you destroy the invading alien army before they land?

Search

If data is on the disc, but you don't know where, this superb utility from the March 1985 issue of *The Micro User* will help you find it.

February 26 to March 3

T/OSB15
B/OSB15

The Osbits guide to the BBC Micro assembler part 15 explains multi-byte division procedures where the division can be up to 32 bits long.

T/SWR18
RFSHead
RFSGen
Demo

The series for programmers using sideways ram continues with a study of the RSF – rom filing system. The RFS is available on all BBC Micro's with 1.0 operating system or higher. Any files – Basic, machine-code, text and so on – can be stored on rom and made permanently and instantly available. In order to store files this way they must be formatted with a block structure similar to that used by the cassette filing system. Module 18 of the course looks at how this is done, and offers a simple RFS interpreter and formatting program.

DateInf
Datebas
Dater

An automatic routine to date and time stamp all files when they are saved to disc from a BBC Master.

T/Strip
M/Strip
M/Spool

Two routines to save text from the View word processor in a form that can be used by any other word processor – even on a different type of computer. The programs operate as printer drivers, but send the output to disc rather than to paper, overcoming the problems of using the inflexible SAVE or SPOOL commands.

Rover

In this game from the January 1985 issue of *The Micro User* your aim is to guide Rover to his food before it's eaten by flies – avoiding the hostile cats en route.

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VISA

Exercise acts like a game

Product: XOR for Schools
Price: £31.63
Supplier: Logotron, Dales Brewery, Gwydir Street, Cambridge CB1 2LJ.
Tel: 0223 323656

XOR for Schools, from Logotron is an adaptation of the XOR game. The original – which consisted of 15 levels of maze problems – has been extended to include a program for generating your own maze puzzles.

The package has two major parts: Game Player, which lets you play maze games, and Maze Designer, where you can design your own mazes. This is accompanied by an excellent manual.

Chapter one covers the thinking skills involved and chapter three informs on how one primary school went about using XOR. The middle chapter – Getting Started – gives the program instructions in a clear concise manner. A nice touch is that the suppliers send two copies of the program disc so one can be stored safely away in case little fingers damage the other one.

Linking the program with the curriculum is difficult. The program puts decision making and thinking skills first, and not as a byproduct of the work. The child is working in a micro environment and any knowledge imparted will be about the maze, the icons and their properties.

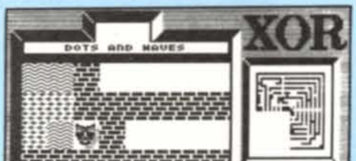
This, however, is educationally a sound practice: The children are motivated to think in a clear logical manner to solve a problem or develop one for others to solve.

When doing this a child has to establish aims, goals and objectives. Factors have to be considered and priorities listed after considering the alternative ways of tackling a problem.

The program is easy to use. After loading, an introductory screen appears, soon followed by an option screen. Options are then selected using the arrow keys, the ones chosen being largely dependent on the hardware available – dual drive, joystick and so on. The main menu then presents you with six options – play game, design maze, design icons, replay, screen dump and program exit.

Assuming you choose to play a game and are using a single drive, you must at this stage change to the data disc before selecting the game option. Another menu appears and you select the maze you wish to play. There are seven, graded in degrees of difficulty, each having a brief synopsis in the manual. Each has a title screen and indicates the progress being made. The level of sound can be adjusted to suit. The graphics are very good and the bouncy tunes accompanying the games present a friendly environment.

At any stage you can press E to escape to the menu and see a controlled replay of what you have done, or if a suitable printer is available print a screen dump at the point you choose. The extension part of the program, Maze Editor and Icon Designer are both menu-driven.



XOR learning screen

Maze Editor lets you create your own mazes. You can select your own icons, place the map quartiles and position the heroes to build up the labyrinth of puzzles. Once you have completed this the game can be saved on disc.

Should you wish, using the Icon Designer, you can edit or redesign the icons which appear in the game, although their original properties remain the same. For working off-screen a maze planner is provided so children can design mazes then test their skills on the computer.

Children familiar with this type of game enjoyed the tasks set, and those who had computers at home and had experienced games like Repton took quickly to the tasks.

They saw the program more as a game than an exercise. Although the manual indicates some of the mazes were designed by 11-year-olds, don't be fooled into thinking this is a definitive age for the program.

Sustained concentration and motivation is needed as the group may well spend at least an hour in any one session. The program appeals to a particular type of child: The competent user who enjoys the challenge of a computer-generated game with all the abstract situations this implies.

Andrew Heaton

Computers and science

Program: Technology and Design
Price: £24.95
Supplier: BBC Soft, PO Box 234, London SE1 3TH.
Tel: 01-576 0548

TECHNOLOGY and Design is a computer-synchronised audio package designed to support the teaching of technology in secondary schools and it is excellent.

Computer-synchronised audio was pioneered four years ago by the BBC when it published its Introducing Science Extra series called Using Your Computer. The technique involves listening to a soundtrack on cassette while using the computer as a display and as a way of exploring ideas. Keyboard responses keep the computer in synchronisation with the audio cassette.

The Technology and Design pack is made up of four 5.25in discs, two audio cassettes, a function key strip and a well-written user guide. It all forms part of a larger package comprising TV and radio programmes, a slide pack and teachers notes.

The materials cover five topics, pneumatics, structures, gearing and linkages, motors and electronic systems. Each topic has a section of the

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◄ *From Page 89*

user guide, parts of which must be photocopied for the pupils' use.

The first topic is pneumatics and right from the opening titles, graphics and stereo sound effects, it exudes the kind of quality present throughout the package.

The pace is just right as you are taken through the fundamental concepts behind pneumatics and introduced to a variety of components and how they are used in systems. All the time the work is linked to practical applications in the world outside.

Investigating

Excellent graphics show how valves, pistons and restrictors can be used to build circuits to do a range of tasks. You are frequently encouraged to stop the audio tape to predict and investigate the ways in which the various screen models work.

The models are drawn alongside circuit diagrams which use conventional circuit symbols and change configuration as the model is operated.

The intention is not to replace practical experience of pneumatic components but to provide an introduction to the subject which can lead on to the real thing, and it succeeds well.

The software and soundtrack for the Structures section are not quite as good. Explanations are brief and there is a lot to hear, understand and do at quite a fast pace. Also the program doesn't tolerate some roms.

Creating structures out of steel, balsa, drinking straws or some other user-defined material is fiddly and involves a lot of function key pressing. Much practice is needed, and still the dreaded *Structure Unstable* appears above your newly-created 2D bridge without any hint of why. Brunel, how did you do it?

Simulating

However, once mastered, the software gives the budding engineer an opportunity to design and test a variety of 2D structures to destruction or otherwise. The model assumes straight, stiff and weightless beams with joints behaving as pivots with no resistance to movement. Forces can be chosen and then applied to the structure and the computer calculates the stresses in the beams and colours them accordingly.

The gearing and links section is not quite what you might expect from its title. It is a computer simulation of a beam balance to illustrate the concept of forces acting at a distance – moments.

The screen shows a beam free to pivot at its centre and a selection of weights, or masses to be more precise. With the help of the cursor keys, weights can be picked up, placed on the beam at a variety of hooking points and their total effect on the beam observed. Well, almost.

Arrows on the screen show the direction of movement, and the digital display shows the net moment but the beam does not move. Arrows to show directions of movement are fine but they do not convey the feel for movement that is so important when dealing with moments.

However, any disappointment is more than compensated for by the balance puzzles set by the computer to test pupils' understanding. At the press of a function key weights fly crazily across the screen to land on the balance, leaving you to remove them without disturbing the beam's equilibrium. A nice touch.

The motors section is intended to show how DC motors are constructed and how they may be used and controlled. Once again the material relates theory to applications in the real world. The construction of motors is described and the interaction between magnets illustrated.

At the end of the presentation is a series of tasks involving the construction of actual circuits to solve specific switching problems. A list of components is included in the user guide.

The last section – electronic systems – uses a haunted stage to develop skills in designing electronic systems. I have never heard electronics introduced by a ghost before, but it certainly works.

The soundtrack grabs the attention and proceeds to give a clear and well-paced explanation of how things work together and what devices are required to produce an effect.

Controlling

Once again there is plenty of encouragement to stop the tape and experiment with the electronic system building blocks which can be moved around the screen and wired together.

Circuits constructed in this way can then be used to control the special effects needed for the on-screen stage performance. Vases can be made to fall, mice scurry, bat's fly and a toe may be waggled!

If you are looking to encourage an interest in technology, as well as teach it, I can do no more than recommend this package. It is no sustitute for real hands-on experience – computer simulations never can be – but it provides a marvellous introduction to five important areas.

Frank Jukes

Working with words

MOST teachers would probably say that the single most useful piece of software is a word processor, of which there are a number of products for all ages from the simple, infant level up to the near-professional View, Interword and so on.

Soft-Teach has attempted to bridge a perceived gap by providing a simple to use word processor with a professional feel to it. The product, Quite Write is disc-based and comes packaged with an instruction book, function key strip and workcards. A second disc, called the document disc, carries the workcards which means you can print off extra cards at a minimal cost. The workcards are clear, well-written and can take a student through the basic operations of word processing without the need to type in chunks of text.

Program: Quite Write
Price: £23.00
Supplier: Soft-Teach Educational, Sturgess Farmhouse, Longbridge Deverill, Warminster, Wiltshire BA12 7EA.
Tel: 0985 40329

By using the 10 cards, pupils should become proficient in such skills as loading Quite Write, entering and altering text, altering page layout, saving, reloading and printing text. The guide is a model of what these books should be –

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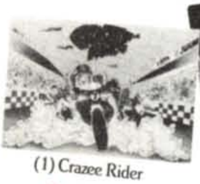

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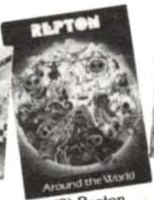

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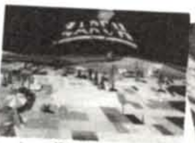

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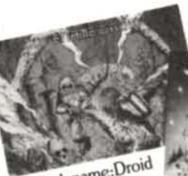
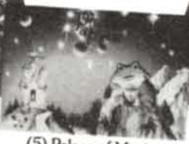
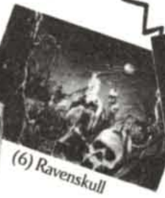


(4) Codename:Droid



(5) Palace of Magic



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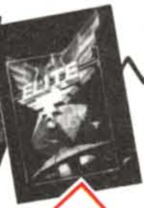

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Soft-Teach has provided first rate support materials.

The word processor uses a Mode 7 display which sets a limit of 40 characters per displayed line, but the screen is a window on the text. Lines of up to 255 characters scroll smoothly sideways as you enter text or use the cursor keys.

The basic features of a word processor are obtained from menus. This has the big advantage that you do not need to remember commands. From menus it is possible to alter the page layout and the printer options. You can insert or delete text and move chunks of it about. The ability to find and replace words is also catered for.

One feature I immediately missed was the ability to centre or right-justify text. Without these, and with no page preview facility, it is hard to produce a good text layout.

Printing is straightforward, with the usual menu system allowing the selection from within the program, of different type styles for Epson-compatible printers. There is also a printer driver generator so that other printers can be accommodated. There are no facilities for enlarged or different fonts.

QUITE-WRITE

By
Tony Ramsay
and
Anna Bartholomew

A WORD PROCESSOR THAT:

- **is easy to use**
- **is professional**
- **introduces word processing.**

Quite Write uses the DFS system, as do most schools, and ADFS users will need to perform a *DISC call before attempting to boot up the disc. Saved files can be read into my normal word processor but the only embedded command – underline text – is not recognized.

Pupils at my school who have tried Quite Write thought it was easy to use. Those who were unfamiliar with word processing have made good use of the workcards and have quickly grasped the required skills. They rapidly realise that the program has limitations and are then keen to move on to a more complex system.

Quite Write fulfils its aim of bridging the gap between the simple and the advanced word processor. It is easy to use, but with a number of limitations. A resourceful teacher will be able to provide workcards equivalent to those with this package, but suited to their existing program.

If Soft-Teach wish to sell this sound and useful product within schools, I feel they must select a lower and more realistic price.

Rog Frost

The truth about TELEX

How much does it cost to go on Telex?

You could go the conventional way and buy a dedicated Telex machine. The cheapest will cost you £1,604 (the Whisper), the dearest £2,892 (the Cheetah). You will also need a separate telephone line, costing £101 to install, plus £404 a year rental. That's a total outlay over the first year of a minimum of £2,109. (All prices include VAT.)

Or you could do what more and more BBC Micro users are doing – use your BBC Micro to double as a Telex machine. And just use your ordinary telephone!

How do I turn my BBC Micro into a Telex machine?

All you need is a modem and appropriate communications software (see the advertisements in this issue), a telephone, and a subscription to *MicroLink*.

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Hide and seek ram

Mark Scott presents a useful utility to protect memory by storing it in unused sideways ram

THIS program provides, among other things, a solution to the problem of memory corruption that occurs when issuing a *BACKUP or *COMPACT command. Ideally you need 32k of sideways ram, but a single 16k bank will suffice in certain cases which we will look at later.

Rom images saved on disc can be loaded into sideways ram and you may have a ram disc facility – but what else can be done with this extra memory?

There is a great deal of scope for using it creatively. Hide and Seek is one such example and the principle on which it operates can be extended to other tasks in which the sideways ram can be treated as a continuous addressable block of memory.

Before I get too technical, I'll describe what the system offers and how to use it.

It is a machine code patch which, once resident in your machine, provides the commands shown in Table I. Upper and lower case may be freely mixed and only the first letter after the *LINE is actually significant.

The idea is to enable you to push the whole of user ram from PAGE – typically &1900 – to HIMEM – typically &7C00 – to the sideways ram so that routines that corrupt user ram can be used safely.

Consider this example: You have a program in memory which you wish to save on a disc. You discover that the disc needs to be tidied up – perhaps deleting a few files and compacting – before you can save your program. This puts you in a spot, as the compaction routine will destroy your program.

The solution is provided by the Hide and Seek system. Issue a *LINE Hide command to save user ram, carry out the compaction, then recover the program – together with all variables, should any be in use – simply by issuing a *LINE Seek command.

Another routine that corrupts memory is the *BACKUP facility and Hide and Seek will avoid common problems here too. *LINE Verify is provided so that you check that your sideways ram is functioning correctly.

It performs a search of all the possible banks that could contain it and for each found it performs a robust non-destructive test. Be warned, however, that *LINE Hide will corrupt much of the contents of sideways ram, overwriting any rom images for example – you can't have it both ways.

You must have at least two 16k banks of sideways ram to use the Hide and Seek facility properly, unless the size of user ram happens to be less than or equal to 16k.

With PAGE at &1900 and a 10k screen mode in use, the user ram is just less than 16k and one bank will do. With more than one bank, it does not matter if the banks are not in adjacent slots –

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TECHNICAL DETAILS

*When the operating system detects a *LINE command it indirects via the user vector userv at address &200,&201. This usually results in a* Bad Command *message being printed, but you can alter the vector to point at your own code.*

*On entry to the code, if the accumulator contains 1 it means a *LINE – rather than *CODE or unrecognised osword call – has been detected and the X and Y registers point to a memory location which is the start of the line of text that followed the *LINE command as a parameter.*

In Hide and Seek only the first character is significant. Masking is used to ensure that the one character parameter is lower case and if no valid parameter is detected then a help message is printed out.

Each of the three routines – Hide, Seek and Verify – need to call the initialisation routine at line 970. This makes a note of the current language and then performs a scan to find which banks are sideways ram. It does this by attempting to write to each bank. If this fails then the bank is taken not to be sideways ram.

As each ram bank is found, its actual number is entered into a lookup table. The first member – logical bank 0 – might be bank 4 in the case of a BBC Master and in this case actual banks 4,5,6,7 would be logical banks 0,1,2,3.

The underlying principle of the program is that two bytes can be used to address 64k of sideways ram memory, but the memory is in 16k banks that each occupy the same position in the machine's memory map.

Each bank starts at location &8000 and ends at &BFFF, but has a different bank number in the range 0 to 15. Given a general two byte address, you need to decide which logical bank should be accessed and then adjust the address to be in the range &8000–&BFFF. The selection routine – line 3040 – performs this essential task. All that remains is to use the lookup table to determine the actual bank number for the operation.

The rest of the program is really an application of the main idea. The Hide routine reads the user ram from Page to Himem – these being determined using appropriate osbyte routines – and writes the data to the sideways ram.

The Seek routine performs the reverse process while the Verify routine takes each bank in turn and then subjects each location within the bank to the following test:

The original contents are saved, then an attempt is made to write binary 00000000 and read it back. If this works the same is done with binary 11111111. If the memory passes this test there cannot be much wrong with it, so the original contents are replaced and the process continues.

Command	Short form	Notes
*LINE		Lists the commands available
*LINE Verify	*LINE V	Finds and tests sideways ram
*LINE Hide	*LINE H	Saves user ram to sideways ram
*LINE Seek	*LINE S	Retrieves previously saved user ram

Table I: Hide and Seek commands

◀ *From Page 93*

they need not be contiguous – the system will find and use them wherever they are.

Type in the listing and save it before you run it. Use of the checksum program is recommended to ensure that you have typed it in correctly. Once you have saved the program, run it and you should see the message:

```
Shall I save the code using:
*SAVE HScode 900 BDE 900
Save (Y/N)?
```

Answer Y to store the machine code on a utilities disc where you can find it in a hurry. You can safely install the system from disc without affecting your current program. Having done this, typing *HScode will install the system and print a start-up message. Check out the system by issuing a *LINE Verify, to check all the sideways ram banks.

Load a program – ideally a large one so that more than one bank needs to be used by the system – and use *LINE H to hide it. Type NEW to wipe it from user ram and then LIST to prove it has gone. If you now type *LINE Seek to get the program back and LIST to display it you'll find the program will have been returned from oblivion.

Note that the code is nearly three pages long and starts at &900. This means that you will not be able to use the programmable function keys, as the program overwrites the area of memory that stores the key definitions. The cassette input and output buffers are also affected – see the Advanced User Guide for more details.

Cassette users will have to put the routine elsewhere, and one solution is to put the code at the usual Page value – &E00 for a normal cassette machine – and set Page higher than usual before doing any work with the user ram.

In the case outlined, Page would have to be at &1100 to make room for the system. Be warned, however, that pressing Break will reset PAGE to its default value and you will have to reset it to the higher value before proceeding.

COMPATIBILITY

The program should work with any upgraded BBC B, B+ or on a Master 128. If a Solidisk upgrade is used, line 120 needs altering as detailed in the REM statements.

It will not work over the Tube because it writes directly to locations &FE30 and &FE32 in the I/O processor memory.

It is a trivial matter to use the legal operating system method to write to these locations – osword with A=6 – but this slows the routine down considerably. You could arrange for these registers to be only accessed when the bank needed changing, but the extra code would make the program exceed the three pages available.

*Anyway, the system would be of very little use with a second processor, as the *COMPACT and *BACKUP routines only affect the I/O processor's memory.*

NON-STANDARD SIDEWAYS RAM

Hide and Seek assumes that your sideways ram can be accessed by writing the required bank number to location &FE30, as is the norm. Solidisk uses another register – &FE32 – in this context. This register must also contain the bank number, for reasons that I shall not go into. If your sideways ram has any odd method of access, as specified in the documentation, then incorporate the appropriate code at lines 1100, 1350, 1820 and 3220.

```
   10 REM Hide and Seek System
   20 REM     by Mark Scott
   30 REM  (c) The Micro User
   40 REM --------------------
   50 REM
   60 REM Next line specifies where
   70 REM the machine code starts.
   80 code%=&900
   90 REM Space for oscli procedure
  100 DIM command 30
  110 REM The Rom Select Register
  120 romsel=&FE30
  130 REM For Solidisk users, the
  140 REM sideways ram access register
  150 REM is at location &FE32
  160 r_a_r=&FE32
  170 REM Operating system routines
  180 osasci=&FFE3:oscli=&FFF7
  190 osnewl=&FFE7
  200 osbyte=&FFF4:oswrch=&FFEE
  210 REM Zero page workspace follows
  220 actual_address=&70:REM and &71
  230 swr_address=&72:REM and &73
  240 ZPwkbyte=&74
  250 first_bank=&75
  260 banks=&76
  270 this_rom=&77
  280 length=&78:REM and &79
  290 mem_ptr=&7A:REM and &7B
  300 userv=&200
  310 REM Assemble the code
  320 FOR pass=0 TO 2 STEP 2
  330 P%=code%
  340 [OPT pass
  350 \ Make user vec point to our code
  360 .redirect_userv
  370 LDA#this_code MOD &100:STA userv
  380 LDA#this_code DIV &100:STA userv+1
  390 \ Print out intro help message
  400 LDX#help MOD&100
  410 LDY#help DIV&100
  420 JSR message
  430 RTS
  440 \ Intercept code starts here
  450 .this_code
  460 CMP#1:BEQ star_line
  470 RTS
  480 .star_line
  490 \ *line detected. XY points to
  500 \ text following the command
  510 STX mem_ptr:STY mem_ptr+1
  520 \ Get the first character
  530 LDY#0
  540 LDA(mem_ptr),Y
  550 \ Convert to lower case
  560 \ if it happens to be upper case
  570 ORA #&20
  580 CMP#ASC"h":BEQ hide
  590 CMP#ASC"s":BEQ seek
  600 CMP#ASC"v":BNE not_us
  610 JSR verify_all_banks
  620 RTS
  630 .not_us
  640 \ Print a help message
  650 \ as no valid parameter detected
  660 LDX#help MOD&100
  670 LDY#help DIV&100
  680 JSR message
  690 RTS
  700 .hide
  710 \ Entry for main to swr transfer
  720 JSR initialise
  730 LDX#saving MOD &100
  740 LDY#saving DIV &100
  750 JSR message
  760 \ transfer main memory to swr
  770 CLC:JSR transfer
  780 JSR reselect_lang
  790 RTS
  800 .seek
  810 JSR initialise
  820 \ Entry for swr to main transfer
  830 SEC:JSR transfer
  840 LDX#restoring MOD &100
  850 LDY#restoring DIV &100
  860 JSR message
  870 JSR reselect_lang
  880 RTS
  890 .ram_table
  900 \ Lookup table to convert
  910 \ logical bank to actual bank
  920 OPT FNequd(&FFFFFFFF)
  930 OPT FNequd(&FFFFFFFF)
  940 OPT FNequd(&FFFFFFFF)
  950 OPT FNequd(&FFFFFFFF)
  960 OPT FNequb(&FF)
  970 .initialise
  980 \ This routine must be called
  990 \ before the system is used.
 1000 \ Get socket holding
 1010 \ current language.
 1020 LDA&F4:STA this_rom
 1030 \ Now find the first swr bank
 1040 \ by trying to write to each
 1050 \ bank in turn.
 1060 LDA#0:STA banks
 1070 LDY#0:LDX#0
 1080 .find_bank_loop
 1090 \ Select a bank
 1100 STY romsel:STY r_a_r
```

```
1110 \ Try two 'random' bytes.
1120 LDA &8000:PHA
1130 LDA &8001:PHA
1140 LDA #&69:STA &8000
1150 LDA #&42:STA &8001
1160 LDA &8000:CMP#&69:BNE not_swr
1170 LDA &8001:CMP#&42:BNE not_swr
1180 \ gets here if swr bank found
1190 TYA:STA ram_table,X:INX
1200 INC banks
1210 .not_swr
1220 PLA:STA&8001
1230 PLA:STA&8000
1240 INY
1250 CPY#16:BNE find_bank_loop
1260 LDA ram_table:STA first_bank
1270 JSR reselect_lang
1280 RTS
1290 .reselect_lang
1300 \ This routine must be called
1310 \ when the swr work is done with.
1320 \ Write to romsel again,
1330 \ to select language as on entry
1340 PHA:LDA this_rom
1350 STA romsel:STA r_a_r:STA &F4
1360 PLA:RTS
1370 .verify_all_banks
1380 \ Searches for SWR and performs
1390 \ a non_destructive robust test
1400 \ on all banks. Reports results.
1410 JSR initialise
1420 LDX#test MOD &100
1430 LDY#test DIV &100
1440 JSR message
1450 LDX#&FF:STX ZPwkbyte
1460 .vfy_all_loop
1470 INC ZPwkbyte
1480 LDX ZPwkbyte
1490 LDA ram_table,X
1500 BMI all_done
1510 TAX:JSR verify_bank:PHP
1520 LDX#bank MOD &100
1530 LDY#bank DIV &100
1540 JSR message
1550 JSR nibble_out
1560 \ If carry set on exit from
1570 \ verify_bank bank failed verify.
1580 PLP:BCS failed_bank
1590 LDX#verified MOD &100
1600 LDY#verified DIV &100
1610 JSR message
1620 JMP vfy_all_loop
1630 .failed_bank
1640 LDX#not_verified MOD &100
1650 LDY#not_verified DIV &100
1660 JSR message
1670 JMP vfy_all_loop
1680 .all_done
1690 \ Print out number of banks found
1700 LDA ZPwkbyte:JSR nibble_out
1710 LDX#banks_found MOD &100
1720 LDY#banks_found DIV &100
1730 JSR message
1740 JSR reselect_lang
1750 RTS
1760 .verify_bank
1770 \ Test ram bank specified by
1780 \ X register. Non destructive.
1790 \ Carry clear on exit if ok.
1800 \ Uses X,Y,and'swr_address'pair
1810 PHA
1820 STX romsel:STX r_a_r
1830 LDA#0:STA swr_address
1840 LDA#&80:STA swr_address+1
1850 LDY#0
1860 .verify_loop
1870 LDA (swr_address),Y:PHA
1880 LDA#0:STA (swr_address),Y
1890 LDA (swr_address),Y
1900 CMP#0:BNE problems
1910 LDA#&FF:STA (swr_address),Y
1920 LDA (swr_address),Y
1930 CMP#&FF:BNE problems
1940 PLA:STA (swr_address),Y
1950 JSR inc_swr_address
1960 LDA swr_address
1970 BNE verify_loop
1980 LDA swr_address+1
1990 CMP#&C0 \ For 16K bank
2000 BNE verify_loop
2010 \ All 16K verified OK
2020 \ So exit with carry clear
2030 CLC:PLA:RTS
2040 .problems PLA
2050 \ Is a problem, exit carry set
2060 SEC:PLA:RTS
2070 .transfer
2080 \ If carry clear, hide
2090 \ If carry set, seek
2100 PHP
2110 \ Find value of himem and save
2120 LDA #&00:STA mem_ptr
2130 LDY#&FF:LDX#0:LDA#&B4:JSRosbyte
2140 STX mem_ptr+1
2150 \ Find value of oshwm and save
2160 LDA#&84:JSR osbyte
2170 STX actual_address
2180 STY actual_address+1
2190 \ Find num of bytes to transfer
2200 JSR calc_length
2210 \ *** Perform data transfer ***
2220 \ Carry clear for main to swr
2230 \ or set for swr to main
2240 LDY#0
2250 \ Zero swr_address
2260 STY swr_address:STY swr_address+1
2270 .tr_loop
2280 PLP:PHP
2290 BCS reading
2300 LDA(mem_ptr),Y:JSR write_swr
2310 JMP skip
2320 .reading
2330 JSR read_swr:STA (mem_ptr),Y
2340 .skip
2350 LDA swr_address
2360 CMP length:BNE more_to_transfer
2370 LDA swr_address+1
2380 CMP length+1:BNE more_to_transfer
2390 JMP exit_transfer
2400 .more_to_transfer
2410 JSR inc_swr_address
2420 JSR inc_mem_ptr
2430 JMP tr_loop
2440 .exit_transfer
2450 PLP
2460 RTS
2470 .calc_length
2480 \ Calculate length bytes as
2490 \ actual_address - mem_ptr -1
2500 \ Result in length,length+1
2510 SEC
2520 LDA actual_address
2530 SBC mem_ptr:STA length
2540 LDA actual_address+1
2550 SBC mem_ptr+1:STA length+1
2560 LDA length
2570 SEC:SBC#1:STA length
2580 LDA length+1
2590 SBC#0:STA length+1
2600 RTS
2610 .write_swr
2620 \ Swr byte access routine.
2630 \ uses 'swr_address'
2640 \ a 16 bit address from &0000.
2650 \ Carry clear for write,
2660 \ Carry set for read
2670 \ First decide bank
2680 JSR bank_select
2690 LDY#0
2700 STA (actual_address),Y
2710 STA ZPwkbyte
2720 \ Check write was ok
2730 LDA (actual_address),Y
2740 CMP ZPwkbyte:BEQ written_ok
2750 BRK
2760 OPT FNequb(255)
2770 OPT FNequs("Failed")
2780 BRK
2790 .written_ok
2800 RTS
2810 .read_swr
2820 \ Main reading routine.
2830 \ Read to acc from 'swr_address'
2840 \ a 16 bit address from &0000.
2850 \ First decide bank
2860 JSR bank_select
2870 LDY#0
2880 LDA (actual_address),Y
2890 RTS
2900 .inc_swr_address
2910 INC swr_address
2920 BEQ inc_hi
2930 RTS
2940 .inc_hi
2950 INC swr_address+1
2960 RTS
2970 .inc_mem_ptr
2980 INC mem_ptr
2990 BEQ a
3000 RTS
3010 .a
3020 INC mem_ptr+1
3030 RTS
3040 .bank_select
3050 PHA
3060 LDA swr_address+1
3070 LDX#6
3080 .shift_loop
3090 LSR A
3100 DEX
3110 BNE shift_loop
3120 \ A is logical bank 0,1,2 or 3
3130 \ so select actual bank
3140 \ from lookup table
3150 TAX
3160 LDA ram_table,X
3170 \ If &FF read, bank is not swram
3180 BPL valid_bank:BRK:OPT FNequb(254)
3190 OPT FNequs("Out of sram"):BRK
3200 .valid_bank
3210 \ Select the bank
3220 STA romsel:STA r_a_r
3230 \ Now adjust the address to be
3240 \ in range &8000 to &BFFF by
3250 \ setting bits 8,7 of
3260 \ swr_address+1 to 1,0
3270 LDA swr_address:STA actual_address
3280 LDA swr_address+1
3290 ORA #&80 \ Binary 10000000
3300 AND #&BF \ Binary 10111111
3310 STA actual_address+1
3320 PLA
3330 RTS
3340 .nibble_out
3350 \ Output low nibble of Acc
3360 AND#&0F \ Just in case
3370 CLC:ADC#ASC"0"
```

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◀ *From Page 95*

```
3380 CMP#(ASC"9"+1)
3390 BPL abcdef
3400 JSR osasci:RTS
3410 .abcdef
3420 ADC#6:JSR osasci
3430 RTS
3440 .message
3450 \ XY points to message, ends &0
3460 PHA
3470 STX mem_ptr:STY mem_ptr+1
3480 LDY#0
3490 .output_loop
3500 LDA (mem_ptr),Y
3510 BEQ done_output
3520 JSR osasci:INY:JMP output_loop
3530 .done_output
3540 PLA
3550 RTS
3560 \ Messages follow,
3570 .saving
3580 OPT FNequs("Saving User Ram")
3590 OPT FNequb(&D):BRK
3600 .restoring
3610 OPT FNequs("Restored User Ram")
3620 OPT FNequb(&D):BRK
3630 .test OPT FNequs("Test banks:"):OPT FNequb(&D):BRK
3640 .bank OPT FNequs("Bank "):OPT FNequb(0)
3650 .verified OPT FNequs(" OK"):OPT FNequb(&D):BRK
3660 .not_verified OPT FNequs(" failed!"):OPT FNequb(7):OPT FNequb(&D):BRK
3670 .banks_found OPT FNequs(" banks found"):OPT FNequb(&D):BRK
3680 .help
3690 OPT FNequb(&D)
3700 OPT FNequs("SWR Utils"):OPT FNequb(&D)
3710 OPT FNequb(&D)
3720 OPT FNequs("*LINE Params")
3730 OPT FNequb(&D)
3740 OPT FNequb(&D)
3750 OPT FNequs("V  Verify Swr")
3760 OPT FNequb(&D)
3770 OPT FNequs("H  Hide Ram")
3780 OPT FNequb(&D)
3790 OPT FNequs("S  Seek Ram")
3800 OPT FNequb(&D)
3810 OPT FNequb(&D)
3820 BRK
3830 .end_system
3840 ]:NEXT
3850 C$="SAVE HScode "+STR$~code%+" "+STR$~end_system+" "+STR$~redirect_userv
3860 PRINT''"Shall I save the code using:"
3870 PRINT"*"C$
3880 PRINT'"Save (Y/N)";
3890 INPUT YN$
3900 IF YN$="Y" OR YN$="y" THEN 3930
3910 PRINT'"Not saved"
3920 END
3930 PROCoscli(C$)
3940 END
3950 DEF FNequb(b%)
3960 ?P%=b%:P%=P%+1:=pass
3970 DEF FNequd(d%)
3980 !P%=d%:P%=P%+4:=pass
3990 DEF FNequs(S$)
4000 $P%=S$:P%=P%+LEN(S$):=pass
4010 DEF PROCoscli($command)
4020 X%=command MOD &100
4030 Y%=command DIV &100
4040 CALL oscli:ENDPROC
```

Get it right!

This listing is included in this month's tape & disc offer. See order form on Page 159.

```
  10 =    0 0
  20 =    0 0
  30 =    0 0
  40 =    0 0
  50 =    0 0
  60 =    0 0
  70 =    0 0
  80 = F179 9
  90 =    0 9
 100 = 5D84 5
 110 =    0 5
 120 = FB31 6
 130 =    0 6
 140 =    0 6
 150 =    0 6
 160 = 134F A
 170 =    0 A
 180 =   D5 E
 190 = FE7F 6
 200 = 2DD3 7
 210 =    0 7
 220 = E445 1
 230 = 94EA 6
 240 = C686 6
 250 = DB63 0
 260 = F1CB A
 270 = 82E5 4
 280 = 245D 5
 290 = 79F2 F
 300 = D7D7 3
 310 =    0 3
 320 = B43B 9
 330 =   7B 4
 340 = 4E48 6
 350 =    0 6
 360 = 2BC3 E
 370 = 4738 3
 380 = 2F2D B
 390 =    0 B
 400 = FF61 C
 410 = B897 7
 420 = CD92 E
 430 = 9843 E
 440 =    0 E
 450 = 4977 D
 460 = 3248 5
 470 = 9843 1
 480 = 8B57 D
 490 =    0 D
 500 =    0 D
 510 = 5FE2 A
 520 =    0 A
 530 = 9B97 5
 540 = ADAB 0
 550 =    0 0
 560 =    0 0
 570 = 806B 6
 580 = FB47 F
 590 = D628 A
 600 = B300 6
 610 = 408E F
 620 = 9843 6
 630 = BCC3 1
 640 =    0 1
 650 =    0 1
 660 = FF61 8
 670 = B897 C
 680 = CD92 A
 690 = 9843 2
 700 = E51A A
 710 =    0 A
 720 = 516E 6
 730 = B57B F
 740 = 90C7 5
 750 = CD92 6
 760 =    0 6
 770 = 156A 0
 780 = 6F2C 1
 790 = 9843 F
 800 = 473C 8
 810 = 516E B
 820 =    0 B
 830 = BFD9 6
 840 = A11E D
 850 = DA6F 6
 860 = CD92 3
 870 = 6F2C D
 880 = 9843 C
 890 = 7700 9
 900 =    0 9
 910 =    0 9
 920 = E625 8
 930 = E625 8
 940 = E625 3
 950 = E625 7
 960 = 37CE F
 970 = 5B39 D
 980 =    0 D
 990 =    0 D
1000 =    0 D
1010 =    0 D
1020 = C3C2 4
1030 =    0 4
1040 =    0 4
1050 =    0 4
1060 = 2CED A
1070 = 4971 D
1080 = 19FC B
1090 =    0 B
1100 = AD9C B
1110 =    0 B
1120 = 38B3 6
1130 = 92E2 F
1140 =  B2F 6
1150 = C790 2
1160 = 445E F
1170 = A395 3
1180 =    0 3
1190 = DE31 A
1200 = AED5 A
1210 = 85E6 E
1220 = D660 3
1230 = C641 5
1240 = 6623 3
1250 = 4038 6
1260 = 359E 8
1270 = 6F2C 8
1280 = 9843 7
1290 = 3FC5 4
1300 =    0 4
1310 =    0 4
1320 =    0 4
1330 =    0 4
1340 = E627 9
1350 = D970 F
1360 = EC5C 1
1370 = B46A 2
1380 =    0 2
1390 =    0 2
1400 =    0 2
1410 = 516E F
1420 = 9BAF F
1430 = 558C 7
1440 = CD92 5
1450 = 2CDA F
1460 = 9C63 D
1470 = 74D7 F
1480 = 1759 F
1490 = 4679 0
1500 = 7B62 B
1510 = C0AD 8
1520 = 7BE8 4
1530 = B5CB 1
1540 = CD92 D
1550 = DBEA 2
1560 =    0 2
1570 =    0 2
1580 = E61D 1
1590 = D3E6 0
1600 = 4844 0
1610 = CD92 8
1620 = 10DC D
1630 = ED0F C
1640 = 6631 C
1650 = 3887 F
1660 = CD92 8
1670 = 10DC A
1680 = EBFE D
1690 =    0 D
1700 = 7A25 1
1710 = FFF0 6
1720 = 4103 2
1730 = CD92 A
1740 = 6F2C E
1750 = 9843 7
1760 = 86B9 5
1770 =    0 5
1780 =    0 5
1790 =    0 5
1800 =    0 5
1810 = 824E 1
1820 = E5CC 0
1830 = B31C 3
1840 =  D7E A
1850 = 9B97 9
1860 = AF89 3
1870 = EC3E 4
1880 = 19EF 8
1890 = 4844 8
1900 = 7A58 8
1910 = 13B4 5
1920 = 4844 7
1930 = DD43 6
1940 = 587B 9
1950 = ADCD C
1960 = 409E E
1970 =  962 D
1980 = 93D5 D
1990 = EA6C 3
2000 =  962 5
2010 =    0 5
2020 =    0 5
2030 = E02A 0
2040 = D855 7
2050 =    0 7
2060 = 9019 1
2070 = 19CC C
2080 =    0 C
2090 =    0 C
2100 = 805E 7
2110 =    0 7
2120 = DAAC D
2130 =  54F E
2140 = BEFD 2
2150 =    0 2
2160 = 1AE8 C
2170 = B479 1
2180 = 3128 C
2190 =    0 C
2200 = F0CD 3
2210 =    0 3
2220 =    0 3
2230 =    0 3
2240 = 9B97 A
2250 =    0 A
2260 = B123 1
2270 = DAF0 7
2280 = 5A4A A
2290 = 9413 A
2300 = 2A01 9
2310 = 557C 6
2320 =  CD2 0
2330 = C45F E
2340 = BA0A A
2350 = 409E D
2360 = 6E39 4
2370 = 93D5 9
2380 = E3DF F
2390 = 8541 D
2400 = 2459 A
2410 = ADCD 7
2420 = 370A D
2430 = F40F F
2440 = 6A45 D
2450 = 4C9A 6
2460 = 9843 3
2470 =  687 6
2480 =    0 6
2490 =    0 6
2500 =    0 6
2510 = 8D00 4
2520 = C396 4
2530 =  C4E 0
2540 = 5C16 1
2550 =  885 5
2560 = 2B97 A
2570 = D97A C
2580 = D52C 2
2590 =  F5C 7
2600 = 9843 4
2610 = 2BD5 4
2620 =    0 4
2630 =    0 4
2640 =    0 4
2650 =    0 4
2660 =    0 4
2670 =    0 4
2680 = E5EF F
2690 = 9B97 8
2700 = AFE4 5
2710 = D74F E
2720 =    0 E
2730 = D3E5 C
2740 = 2CC4 3
2750 = E2BF 2
2760 = 3ACA C
2770 = 93F9 0
2780 = E2BF 3
2790 = F0C9 6
2800 = 9843 7
2810 = 4468 F
2820 =    0 F
2830 =    0 F
2840 =    0 F
2850 =    0 F
2860 = E5EF 5
2870 = 9B97 F
2880 = D3E5 0
2890 = 9843 C
2900 = CF75 0
2910 = E2BF 5
2920 = 68B7 E
2930 = 9843 D
2940 = 520D A
2950 = DC8A 3
2960 = 9843 B
2970 = C140 E
2980 = E233 F
2990 = 94AD D
3000 = 9843 A
3010 = 596E D
3020 = 8C8E 8
3030 = 9843 D
3040 = 13A5 B
3050 = 824E A
3060 = 93D5 6
3070 = CC61 5
3080 = 77D5 D
3090 = 1A09 C
3100 = E8A9 8
3110 = F4D2 3
3120 =    0 3
3130 =    0 3
3140 =    0 3
3150 = 670E E
3160 = 4679 7
3170 =    0 7
3180 = C13C B
3190 = 9364 6
3200 = 869A F
3210 =    0 F
3220 =  ADA C
3230 =    0 C
3240 =    0 C
3250 =    0 C
3260 =    0 C
3270 = 670B 8
3280 = 93D5 B
3290 = 192B 2
3300 = 9885 5
3310 = 32B8 0
3320 = 4E8A F
3330 = 9843 7
3340 = D1BD F
3350 =    0 F
3360 = 643C F
3370 = 2692 8
3380 =  EEE F
3390 = 13DB A
3400 =  2BF 7
3410 = 6683 8
3420 = F7D9 3
3430 = 9843 4
3440 = 8868 0
3450 =    0 0
3460 = 824E E
3470 = 5FE2 2
3480 = 9B97 0
3490 = 8B6A 9
3500 = 2065 F
3510 = 1C91 7
3520 = FABC 4
3530 = CFAB D
3540 = 4E8A 2
3550 = 9843 6
3560 =    0 6
3570 = 30FD B
3580 = B666 0
3590 = E0CF F
3600 = 553B 4
3610 = 2943 6
3620 = E0CF 5
3630 =  DE3 0
3640 = AB33 4
3650 = 74EA 9
3660 = 6478 5
3670 = 7E52 C
3680 = 5B46 0
3690 = DCFD 1
3700 = B548 2
3710 = DCFD 5
3720 = F707 F
3730 = DCFD 4
3740 = DCFD 6
3750 = 51B2 6
3760 = DCFD 4
3770 = 1F34 1
3780 = DCFD 9
3790 = 6226 B
3800 = DCFD 7
3810 = DCFD 3
3820 = E2BF F
3830 = B3AD 2
3840 = DA42 2
3850 = 5CA0 F
3860 = A6D7 F
3870 = 1311 D
3880 = 5385 6
3890 = 8415 4
3900 = E56D 9
3910 = E9AD A
3920 = FD2E 9
3930 = FAED 0
3940 = FD2E 3
3950 = A774 3
3960 = E52D 3
3970 = D851 2
3980 = 3771 8
3990 = C8DB 8
4000 = 2FF3 B
4010 = DE97 6
4020 = 204E B
4030 = BBEC E
4040 = C3BF 1
```

THE MICRO USER

READER'S SURVEY

Over £1000 in prizes

Help celebrate our birthday – win a fabulous prize!

This month marks The Micro User's fifth birthday. To celebrate the occasion we've got seven top-class prizes worth over £1,000 for you to win. All you have to do is answer as many questions as you can in the questionnaire below.

Add your name and address if you want to be eligible for the draw, then send off the form (no stamp is required). The senders of the first seven forms to be pulled from the sack on March 31 will each receive a prize.

THESE ARE THE PRIZES:

MicroLink multi-speed modem
This powerful top-of-the-range modem offers three speeds: 1200/75, 300/300 and 1200/1200. It includes such extra features as auto-dial and auto-answer. Software included.
Value: **£169**

Watford's 32k Shadow Ram PLUS Interword
Add an extra 32k of ram to your BBC Micro. As well as this superb addition to any machine there is also a copy of Interword, the powerful word processor from Computer Concept's best-selling Inter family.
Value: **£98**

Tynesoft games bundle
A bundle of 16 top titles from Tynesoft including their latest releases Winter Olympiad 88 and Indoor Sports, plus such winners as Spy Vs Spy, Phantom, Jet Set Willy II, Future Shock and The Big KO.
Value: **£140**

Cambridge Computer's Z88

A versatile portable micro with superb built-in software: BBC Basic, word processor, database, terminal emulation, filer, diary and calculator. The Z88 now has its own section in the Micro User to help you make use of its full potential.

Value: **£287.50**

Morley Teletext Adapter
Access more than 1,000 pages of Teletext information and download the free telesoftware. Features auto-tuning, and comes with a 16k ATS rom and a 16k utilities rom.
Value: **£119.95**

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Value: **£89.30**

MicroLink dual-speed modem
Connect your BBC Micro to the outside world! This superb modem works at 300/300 and 1200/75 and comes complete with easy-to-use communications software.
Value: **£99**

Please tick your reply in the boxes provided. You don't have to fill in an answer if you don't want to. You may photocopy this page to protect your magazine if you wish.

ABOUT YOU

How old are you?

☐ Under 11
☐ 11 - 15
☐ 16 - 18
☐ 19 - 22
☐ 23 - 30
☐ 31 - 39
☐ 40 - 50
☐ Over 51

Sex? M / F Occupation?________________

What area of computers or computing interest you?

	Very much	A little	Not at all
Business	☐	☐	☐
Arcade Games	☐	☐	☐
Adventures	☐	☐	☐
Comms	☐	☐	☐
Programming	☐	☐	☐
Hardware	☐	☐	☐
Future Tech	☐	☐	☐
Learning about:			
Programming	☐	☐	☐
Hardware	☐	☐	☐

How do you rate your knowledge of:

	None	Poor	Average	Good	Excellent
Basic programming	☐	☐	☐	☐	☐
6502 Machine code	☐	☐	☐	☐	☐
ARM code	☐	☐	☐	☐	☐
Hardware	☐	☐	☐	☐	☐

ABOUT YOUR MICRO

What micro(s) do you own or use?

☐ BBC Model A or B
☐ BBC Compact
☐ Archimedes
☐ BBC Master
☐ Electron
☐ Z88

How long have you had a BBC Micro?

☐ Under 1 year
☐ 2-3 years
☐ 1-2 years
☐ 3+ years

Do you have any other computer? Yes/No

Which one(s)?________________

Turn to Page 98 ►

THE MICRO USER READER'S SURVEY

◀ From Page 97

Are you thinking of buying another computer? Yes/No

Which one?____________________

What other hardware do you have?

☐ Monitor	☐ Colour ☐ Monochrome Make__________
☐ Disc drive	☐ 40 ☐ 80 ☐ Single ☐ Double Make__________
☐ Printer	☐ Daisywheel ☐ Dotmatrix ☐ Laser Make__________
☐ Modem	Make__________
☐ Sideways ram	Make__________
☐ Teletext	Make__________

Please list any others:____________________

What type of hardware would you like next for your micro?

____

Please indicate which of the following types of software you have:

☐ Word processor
☐ Database
☐ Assembler
☐ Disc utilities
☐ Spreadsheet
☐ Other languages
☐ Basic utilities

What type of software are you most likely to buy next for your micro?____________________

____

What do you use your BBC Micro for (fill in your own ideas in the spaces at the end of the list)?

	Only	Mostly	Some	Seldom	Never
Arcade games	☐	☐	☐	☐	☐
Adventure games	☐	☐	☐	☐	☐
Programming	☐	☐	☐	☐	☐
Business	☐	☐	☐	☐	☐
Own letters	☐	☐	☐	☐	☐
Home accounts	☐	☐	☐	☐	☐
....	☐	☐	☐	☐	☐
....	☐	☐	☐	☐	☐
....	☐	☐	☐	☐	☐
....	☐	☐	☐	☐	☐

What software do you use most frequently?____________________

Is there any software (apart from games) you've bought that you never use?____________________

THE MAGAZINE

How long have you been reading *The Micro User*?

☐ 0-3 months ☐ 4-6 months ☐ 7-12 months
☐ 1-2 years ☐ 2-3 years ☐ from issue 1

How often do you buy *The Micro User*?

☐ Every issue ☐ 1 in 2 ☐ Less regularly

How do you get *The Micro User*?

☐ Subscription ☐ Newsagent
☐ Computer dealer ☐ A friend

How many other people read your copy of *The Micro User*?

☐ None ☐ 1 ☐ 2 ☐ 3 ☐ more than 3

What other computer magazines do you regularly buy?____________________

____

What do you like most about *The Micro User*?____________________

____

What do you like least about *The Micro User*?____________________

____

How often do you buy the magazine cassette or disc?

☐ Every month ☐ Occasionally ☐ Never

If occasionally, what prompts you to buy it?____________________

____

Which program listings do you type in?

	Usually	Sometimes	Never
Games	☐	☐	☐
Utilities	☐	☐	☐
Tutorials	☐	☐	☐
Educational	☐	☐	☐

What is the maximum length of listing you would want to type in?

☐ Half page ☐ 1 page ☐ 2 pages
☐ 3 pages ☐ 4 pages ☐ 5 pages

Please circle the number which matches your level of interest in the following subjects (0 least — 9 most):

News	0	1	2	3	4	5	6	7	8	9
Software reviews	0	1	2	3	4	5	6	7	8	9
Hardware reviews	0	1	2	3	4	5	6	7	8	9
Body Building	0	1	2	3	4	5	6	7	8	9
Communications	0	1	2	3	4	5	6	7	8	9
Problems solved	0	1	2	3	4	5	6	7	8	9
Library	0	1	2	3	4	5	6	7	8	9
Mad Hatter	0	1	2	3	4	5	6	7	8	9
Hac Man	0	1	2	3	4	5	6	7	8	9
Letters	0	1	2	3	4	5	6	7	8	9
Education	0	1	2	3	4	5	6	7	8	9
Business	0	1	2	3	4	5	6	7	8	9
Spreadsheets	0	1	2	3	4	5	6	7	8	9
Games programs	0	1	2	3	4	5	6	7	8	9
Utilities programs	0	1	2	3	4	5	6	7	8	9
Archimedes	0	1	2	3	4	5	6	7	8	9
Z88	0	1	2	3	4	5	6	7	8	9
Offers	0	1	2	3	4	5	6	7	8	9
Pull out features like Repton	0	1	2	3	4	5	6	7	8	9

Indicate any articles or series you would like to see in future editions of The Micro User____________________

____

Any other comments you would like to make about *The Micro User*____________________

____

SHOWS

Did you attend an Electron & BBC Micro User show in 1987?
☐ Yes ☐ No

Please circle the number that matches what would attract you to come to a show in 1988 (0 least – 5 most)?

New products	0	1	2	3	4	5
Bargain offers	0	1	2	3	4	5
Technical advice	0	1	2	3	4	5
Hands on testing	0	1	2	3	4	5
Show themes/theatre	0	1	2	3	4	5

Anything else not mentioned here?____________________

Thank you for filling in this survey. Now send it to: **Reader Survey, The Micro User, FREEPOST, Europa House, Adlington Park, Adlington, Macclesfield SK10 5NP.** *No stamp required.*

If you wish to take part in the Prize Draw please fill in your name and address.

Name:____________________

Address:____________________

____________________ Post code__________

OPUS DRIVES A BETTER BARGAIN

2 Megabyte Dual Drive

Only £209.95

5¼" double-sided 80/40 track hardware switchable. Formatted capacity with DDOS 1.4 Mb.

1 Megabyte Single Drive

Only £109.95

5¼" double-sided 80/40 track hardware switchable. Formatted capacity with DDOS 720 K.

Whichever way you look at it – price or performance – these 1 and 2 Megabyte disc drive bargains from Opus take some beating. With prices that include VAT and FREE delivery anywhere in mainland Britain, it's hardly surprising they're Opus best-sellers.

Quality Opus Disc Drives

As a major supplier of disc drive products to the home, education and business markets in Britain, the Opus name is your guarantee of quality. Both our drives feature reliable direct drive mechanisms, lower power consumption and fast track access times.

The Opus DDOS

Choose either of our special drive bargains and we'll reduce the price of our double density disc interface by a third! It's yours for just £40 instead of the normal asking price of £60.

The Opus DDOS uses the BBC B+ disc controller chip for compatibility with all leading software titles. It can also handle tape to disc transfers, includes Format and Verify utilities on ROM and has a powerful machine code operating system with up to 248 files.

To order your drive and take advantage of our special DDOS offer, call Opus now on **0737 765080** or simply post the coupon below.

To: Opus Supplies Limited, 53 Ormside Way, Holmethorpe Industrial Estate, Redhill, Surrey
Please rush me the following: (PRICES INCLUDE VAT AND CARRIAGE)

_______ 1 Megabyte (unformatted) System(s) at **£109.95** each

_______ 2 Megabyte (unformatted) System(s) at **£209.95** each

_______ Opus Double Density Disc Interface at **£40.00** each
(Only when purchased with drive)

I enclose cheque for £ _______________ or please debit my credit card account with the amount of £ _______________

My Access ○ Visa ○ no is: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

NAME _______________

ADDRESS _______________

____

TELEPHONE _______________

Opus.

MU3

1

Watford Electronics

Jessa House, 250 Lower High Street, Watford WD1 2AN, England
Tel: Watford (0923) 37774 Tlx: 8956095 Fax: 01 950 8989
Shop Hours: 9am to 6pm (Mon.-Sat.) Thursdays 9am to 8pm
All prices exclusive of VAT; subject to change without notice & available on request.
Credit Card Orders (ACCESS & VISA) Tel (0923) 33383 or 50234 (24 Hours)

Acorn
The choice of Experience

The choice before and after the experience

A Computer for BUSINESS, RESEARCH, EDUCATION & HOME USE

Archimedes micro

The Acorn Archimedes range of microcomputer comprises four machines – the 305 and 310 with 0.5 and 1 MB of RAM, and the 410 and 440, with 1 and 4 MB. All have 0.5 MB of ROM and one 3.5" floppy disc drive of 800K as standard. The 440 also has a Winchester drive of 20MB – all mounted internally.

They have separate keyboard and a three button mouse as standard. The Keyboard is compatible with the new IBM ATE layout, with 12 function keys.

The standard display is a high resolution mono colour monitor. A colour, multifrequency monitor is optional.

The screen modes include:

- 80 × 25 or 32 characters, in 2, 4 or 16 colours for wordprocessing, etc.
- 132 × 25 or 32 characters, for spreadsheets, etc.
- Up to 640 × 256 dots × 256 colours (with single frequency monitor) and up to 640 × 512 dots × 16 colours (with a multi frequency monitor), for graphics, etc.

The sound system can have up to eight channels playing at once, from up to 32 instruments or voices, using waveform synthesis and stereo output.

The outlets for the monitor, printer, serial port and audio are all at the rear, and have industry standard connectors.

The 410 and 440 have a backplane for four expansion podules and the circuitry for a Winchester disc drive as standard.

The complete operating system – including Window Manager and Desktop – is in 0.5 MB of ROM. It can access directly all the RAM that can be fitted (upto 4 MB).

The Advanced Disc Filing System uses robust, pocket-sized 3.5" discs with a new 800K format, but also reads, writes and formats the 640K discs used by the Master series. As well as 25% more capacity, the new format allows almost four times the data transfer rate.

A battery-backed clock-calender, and CMOS RAM to hold configuration setting is standard.

Expansion is via internal plug-in boards (podules), which connect with the backplane.

ARCHIMEDES PRICES

305 Series	
● Entry System	£699
● with Green Monitor	£749
● with Colour Monitor	£899
310 Series	
● Entry System	£775
● with Green Monitor	£825
● with Colour Monitor	£975
310M Series	
● Entry System	£835
● with Green Monitor	£885
● with Colour Monitor	£1035
410 Series	
● Entry System	£1339
● with Green Monitor	£1449
● with Colour Monitor	£1599
440 Series	
● Entry System	£2299
● with Green Monitor	£2349
● with Colour Monitor	£2499

(Securicor carr. £7 on Micros)

● 0.5 Mb RAM for 305	£85
● Podule Backplane	£37
● ROM Podule (Computer Concepts)	£49
● Archimedes Ref Manual	£29
● ARM Assem. Lang Prog Manual	£12

Podules expected this year (from Acorn unless stated) include:

● **2nd 800K floppy disc drive (for 305, 310 & 410)**	£125
● Econet Network Board	£43
● Backplane for 2 podules, with fan (305, 310)	£39
● I/O Podule (with User port, Analogue port & 1MHz bus)	£79
● MIDI add-on to I/O Podule	£29
● ROM Podule (takes five 8 bit ROMs, of 16, 32, 64 or 128K)	£59
● Modem Podule (Beebug)	TBA
● Real time Video Digitiser (Watford)	TBA
● Sound Sampler (Armadillo)	£78
● Speech Podule (Tubelink)	TBA

Due in the 2nd quarter 1988

PC Podule, with 10 MHz 80186, 640K and floppy disc interface, (for all models). This should run about 3.5 times as fast as an IBM-PC. Fully IBM compatible.

SPECIAL OFFER

With every Archimedes Micro purchased from us, we are giving away absolutely **FREE** a 5¼", double sided disc drive with PSU, (1 Megabyte unformatted), plus the special Archimedes interface cable, worth **£125**.
(P.S. This offer does not apply with 0% finance scheme mentioned below).

0% (APR) FINANCE

*For a limited period, Watford Electronics are able to offer the Archimedes range of microcomputers at **0% (APR)** finance. Credit facility available for up to 12 months, subject to status. Please inquire for further details. (Watford Electronics are Licenced Credit Brokers)*

NEW

CREDIT TERMS now available. Please telephone or write in for further information.

What Archimedes can do

The software on the welcome disc includes four applications.

"PAINT" is a simple mouse driven art package, operating in the 640 × 250 × 16 colour screen mode. Images can be produced without any programming and saved to disc for use elsewhere.

The Sprite Editor allows sprites to be created pixel by pixel in the 640 × 256 × 16 and 256 colour screen modes. It can also be used to edit pictures from "Paint". The results can be used in Basic programs for animated graphics.

The Font Designer "allows you to design individual letters and symbols – and save them together as a font". They may be "anti-aliased", for even better appearance on screen.

The Music Editor allows you to enter music in standard notation, with up to four "parts", and save it to disc. It may be played via the internal speaker (in mono) or via external headphones or hi-fi (in stereo). The voices or instruments (of which there are nine as standard), and their volume, tempo and stereo position may all be varied while playing.

BBC Basic 5

This is upwards compatible with earlier versions, so most programs written in them will run – though far faster. Even using a 305, up to 370K is available in Basic. It also affords access to all the new graphics, windowing and sound facilities – as shown by the applications on the Welcome Disc. As well as being in the system ROM, BBC Basic 5 is provided on disc for loading into RAM because it then runs about 40% faster. This speed makes it the FASTEST MICRO IN THE WORLD". BBC Basic 5 includes an in-line Assembler.

WORDPROCESSORS

Wordwise +	£20	View	£50
Image-Writer	£26	Viewspell	£32
Interword ROM	£39	ViewIndex	£13

DATABASES

System's Delta Plus	£60
AlphaBase	£43
Viewstore	£52

SPREADSHEETS

Intersheet ROM	£39	Viewsheet	£50

BUSINESS GRAPHICS

Interchart ROM	£25
GammaPlot	£30

INTEGRATED PACKAGES

Logistix – Database, Spreadsheet, Time Management & Business Graphics	£95

ACCOUNTS PACKAGES

Meadow Computers' suite of 4 Modules Minerva's suite of 5 Modules	P.O.A.

GRAPHICS, ART & DESIGN

Interchart	£25	Gamma Plot	£30
Artisan	£34	Gamma Plus	£60

GAMES

Zarch	£17
Toolkit (Beebug)	£33

EDUCATION

A great many packages are expected in early 1988. The topics include: Business Studies, Maths, General Science, Biology, Physics, Chemistry, Economics, Geography, History & Music.

PC EMULATION

The Acorn PC Emulator (for 310, 410 & 440), includes MS-DOS 3.21 and is available NOW at £89. It runs most MSDOS and many PC-DOS applications (which number over 10,000). Compared with IBM PC, this all-software emulator can calculate about half as fast, and write to the screen about a quarter as fast. This makes it more suitable for running spreadsheets (such as Lotus 1-2-3) than wordprocessors (such as Wordstar). However it includes utilities for copying disc files between DOS and ADFS formats, so that data may be transferred to and from Archimedes applications. The 3.5" discs used by the new IBM PS/2 models, and by many DOS portables, may be read, written and formatted directly. 5.25" discs require an additional, external drive, which is available as an option. The PC Podule (due second quarter '88), will run very much faster.

£99

LANGUAGES

Acornsoft ANSI "C", ISO-Pascal, Fortran 77, Cambridge LISP and PROLOG X are all available now at **£95** each, as is the Twin Editor, at **£29**. These require at least a 310. The ANSI "C" affords access to all the graphics, windowing and sound facilities of the Archimedes and executes at exceptional speed – 14 to 26 times that of a PC, 5 to 10 times that of an AT, and as fast as most 386 machines. (For demonstration, call in at our retail shop.

If you require technical literature, then simply telephone us).

Archimedes to BBC SERIAL LINK

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with two disks, one 5.25" for the BBC, the other 3.5" format for the Archimedes, and the necessary cable to connect the two computers. Using this package it is possible to transfer any data from the BBC to Archimedes at upto 19200 baud.
By far the easiest way to transfer data to your new computer.

Only £25

Archimedes 5¼"/3½" Disc drive Interface

With this interface it is possible to connect almost any 5¼"/3½" disc drive with its own power supply to the Archimedes. Upto FOUR drives can be connected and NO SOLDERING is involved. Supplied complete with necessary lead.

Only £25

Note: This is not simply a lead. Attempting to connect an external disc drive by direct connection may result in damage to your Archimedes.

Archimedes Printer Lead	**£8.50**
Archimedes Monitor Lead	**£7.50**

BBC MASTER

BBC MASTER 128K Micro incl. Acorn's: View, Viewsheet, ADFS, BASIC Editor & TERMINAL **£379**

SPECIAL OFFER

FREE . . . £105 worth of Hardware & Software

Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control and ***Watford's*** *3½", double sided 1 Megabyte (unformated) single disc drive complete with cables, ready to connect to the micro – with every BBC Master purchased from us this month.*

BBC MASTER with Turbo Board + above SPECIAL OFFER	**£475**
512K Processor Add on Board "inc. Mouse and GEM package"	**£185**
BBC AIV (Domesday) System	**£4479**

ADD-ONs & ACCESSORIES

Turbo 65C102 Add-on Module	**£95**
Econet Module for the Master	**£40**
Twin ROM Cartridge for Master	**£7.50**
Quad ROM Cartridge for Master	**£12**
Universal Processor Adaptor	**£75**
Master Reference Manual I	(No VAT) **£14**
Master Reference Manual II	(No VAT) **£14**
Master Advance Ref. Manual	(No VAT) **£19**
64K Upgrade Kit for B+	**£32**
Acorn 1770 DFS Kit complete	**£41**
ECONET Upgrade Kit for BBC	**£42**
ALL ECONET UPGRADES Available	
ARIES' Professional IEEE Interface	**£238**
Acorn IEEE Interface Complete	**£265**
Morley Teletext Adaptor with ATS Rom	**£99**

BBC MASTER COMPACT

All Master Compact Microcomputers are supplied complete with an integral 3½" Disc Drive and various educational and professional bundled software.

System 1	Standard Package	**£310**
System 1A	System 1 + TV Modulator	**£322**
System 2	System 1 + Green Hires Monitor	**£364**
System 3	System 1 + Medium Res Colour Monitor	**£478**
RS232 Kit for BBC Compact		**£25**
Additional 3½" Drive for BBC Compact		**£90**

(Securicor carriage £7)

CO-PRO Adaptor

CO PRO ADAPTOR

Now for the first time you can add the Master Co-processor boards, to your standard BBC model B, or B Plus. With this brand new launch from Watford Electronics you can attach any BBC Master co-processor to the original BBC Micro. Once again Watford strides ahead with a new concept in BBC B Micro add-ons. This unique external Co-Pro Adaptor, is protected by patent applications.
Use the super fast Turbo Board with your BBC B, it is much faster than the 6502 2nd processor superseding it.
With the 512K addon your standard BBC machine achieves IBM PC compatibility at a realistic price running GEM, Lotus 123 and many other programs. Included with the 512k package is a high precision mouse and the Digital Research GEM suite of software; GEM Desktop, GEM Write GEM Paint. This requires both the 1770 DFS and the ADFS to be fitted to your computer.
To use other co-processors you require a BBC B with DNFS 1.20 or higher, or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly like a second processor.
Master owners may use Co-Pro to add a second Co-processor externally.
Watford, brings power to your BBC at only:

£35 (carr £5)

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

VISA

The 80186 Co-Processor

This package consists of the Master 512 board, Watford Co-Pro Adaptor, 1770 Disc Upgrade and Acorn ADFS. The Master 512 board using the 80186 16 bit Processor at 10MHz and running Digital Research DOS Plus, gives a high degree of IBM compatibility at an extremely reasonable price. Included in the 512k package is a mouse and the amazing Digital Research GEM suite of software; GEM Paint, GEM draw and GEM desktop giving a complete Mouse Icons environment (All other GEM packages will work on the 512k). Famous packages that will work with the 512k board include Wordstar, Dbase II, Lotus 123 and many others. The only requirement to upgrade any BBC Model B to this system is you must have twin 80 track disc drives.

£259

65C102 2nd PROCESSOR

This amazing package consists of the Acorn 65C102 'Turbo' Board, the Watford Co-Pro Adaptor and Acorn 1.2 DNFS ROM. The 'Turbo' board, running at 4MHz with 64k of additional RAM will increase the speed by between 50 and 200% depending on the application running, and allow a BASIC program of upto 44k in any screen mode. Simply by plugging in the Co-Pro and the DNFS ROM with its special Tube host code and you massively increase the power of any Model B.

£135

SPECIAL OFFER

EPROMs for BBC's Sideways ROMs.

2764-250nS **£3.00**
27128-250nS (12V5) **£3.25**
27128-250nS (21V) **£4.25**

RAMs (Low power) for ATPL, WATFORD, etc.,
Sideways ROM Boards

6264LP (8K) £2.50
2 × 6264LP (16K) £4.80

Z88 Sinclair's Portable Micro

Watford Electronics announce a very special new – and affordable portable microcomputer, tailor-made for the BBC Micro user on the move – the Cambridge Z88.

The Cambridge Z88 is a versatile portable micro, bursting at the seams with built-in software ready and waiting for you to use at the push of a button. There is BBC BASIC, a word processor, a database, a terminal, a filer a diary and a calculator, all integrated and all inclusive!

The Cambridge Z88 uses just four AA batteries, and from this it will store all of your programs and files on a built-in RAM disc, so there are no cassettes to worry about or discs to lose.

The LCD display is particularly impressive, using state of the art Supertwist technology, the display is sharp at all times, and clear under even the worst lighting conditions.

The word processor is based on Acorn's View package; View is the most popular word processor available for the BBC Micro, and files and programs written on the Z88 can be transferred to and from the BBC Micro with consummate ease.

The Pipedream word processor is possible the single most powerful package written for a portable yet! Being an integrated Spreadsheet and word processor you can combine text and numbers to create stunning reports, timetables or simply letters in a variety of column widths (up to 80 column) and numeric data can be freely sorted searched and calculated INSIDE a text file – a feature only previously available on much more expensive software packages running on large machines.

Nearly all of the 32K memory is available as the RAM Disk, although additional memory packs of 128K are also available, just plug them into the machine (no soldering – no screwing) and you have four times the memory you had before, all of which is available to the Word Processor.

Connecting the Z88 to the BBC Micro is easy; by plugging in the RS232 cable from the Z88 into the RS423 socket in the back of the BBC Micro, a data exchange as fast as 19200 baud is achieved, making the Z88 a fast machine for data transfer.

Custom software is available for the BBC Micro enabling automatic transfer of files to and from the Z88 with automatic conversion and full error checking. The connecting lead plugs straight into the back of the BBC Micro and into the side of the Z88 to form a reliable data link faster than some disc drives!

The Z88 is rugged, reliable, lightweight and compact. It is considerably lighter than all other portable computers currently available, and because it doesn't need disc drives, it is more reliable than any PC "laptop" portables making it especially useful to the BBC Micro owner away from work or home.

Here's what A&B Computing had to say about the Z88:

"The Z88 is an especially worthy machine to have on the move because the files it creates in Pipedream are directly compatible with View Professional... you can write a full report using all of the facilities of Pipedream, port it across using the BBC link software and load it into View Professional".

"The Z88 is surprisingly easy to connect to the outside world – it simply has oodles of RAM disc (up to three megabytes) which can be plugged into the machine".

Need we say more? The Cambridge Z88 – a very special computer. Our Managing Director liked it so much that he uses one constantly.

Price: **£249** **(carr £3)**

FREE

As an introductory offer, we are giving away, 4 rechargeable batteries and a compact Mains Battery Charger absolutely FREE with every Z88 bought from us this this month.

ACCESSORIES

Mains Adaptor	**£8.65**
32K RAM Pack or 32K EPROM Pack	**£17.35**
128K RAM Pack or 128K EPROM Pack	**£43.40**
Z88 BBC or PC Link	**£21.70**
Z88 EPROM ERASER	**£34.75**
Serial Printer Cable	**£8.65**
Parallel Printer Cable	**£24.00**
Z88 Modem	**£86.90**

Continued →

We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop. **All Monitors are supplied complete with BBC connecting leads FREE.**

MICROVITEC 14"

1431 – Standard resolution as used on the BBC television computer programme	**£175**
1451 – Medium resolution, suitable for word processing in mode 0	**£225**
1441 – High res, exceeds the capabilities of the BBC micro	**£359**
1431AP RGB + PAL and AUDIO	**£199**
1451AP RGB + PAL and AUDIO	**£255**
2030 CS 20" Med Res	**£380**
2040 CS 20" Hi Res	**£675**
Dust Cover for Microvitecs	**£5.50**
Touchtec 501 Touch Screen	**£239**

TAXAN 12/14"

- **TAXAN Super Vision 2 Type 620** Hi-res RGB Colour monitor. Ideal for Wordprocessing **£269**
- **TAXAN Super 3, Type 625** Ultra Hi-res, RGB Colour) Text mode switch allows monochrome text display in Green, Amber, White reverse or White on Blue **£319**
- **TAXAN 14" Multisync 770 Plus** – An autoscanning Ultra high res, colour monitor. Ideal for Archimedes **£449**

- Philips BM7542 12" Paper White Monitor. Attractively finished high res monitor. Has an etched glass anti-glare screen and a tilt stand for optimum viewing angle. 1000 x 850 pixels resolution coupled with high contrast makes it ideal for both word pro and graphics. The paper white display is ideal for DTP and CAD. Has a Video/Audio input. **Only £65**

STAR BUY

- **PHILLIPS 14"** Hi-Res, dark glass, attractively finished Colour Monitor – supplied complete with RGB, SKART and Audio/Phono Inputs. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display.

ONLY £195

ZENITH

"Now Test Bureau Recommended for use in Education"

12" high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. (These are the same professional quality, stylishly finished monitors as used in the larger Zenith PC Sys.)

Green (New Design) Hi-resolution	**£66**
Amber (New Design) Hi-resolution	**£70**

N.B. carriage on Monitors **£7** (securicor)

SPARE LEADS

BNC Lead for Zenith or Philips	**£3**
Skart Monitor Lead	**£5**
RGB lead for TAXAN Monitors	**£3**

SWIVEL BASES

for Video Monitors

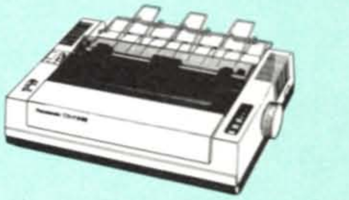
Our professional type swivel bases have front adjustable control. This alleviates the need to lift the monitor when adjusting the viewing angle.

for 12" Monitors **£10** (carr. £2.50)
for 14" Monitors **£14** (carr. £2.50)

Anti-Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for all wordprocessor users. Hundreds of these screens are in daily use in various branches of one of the leading High Street banks. **£12**

Panasonic KX-P1081



Available NOW at a superbly realistic price, the KX-P1081 perfectly balances features, quality of construction and Value for Money to produce the printer of tomorrow, here today, ready to sweep the current generation of machines away.

Ingenious innovation in terms of software control codes permits great flexibility when it comes to defining the print style. A nippy **120 cps** of clear Draft text backs up the crisp 24 cps Near Letter Quality text mode, with upto 40 superbly useful downloadable characters. A delightful range of assorted character widths is efficiently supported, with sizes ranging from a broad 5 cpi to petite 17 cpi, EVEN in NLQ mode. Some of the extensive support for serious use includes specialised functions to perform justification, centering and even left and right ranging. Proportional spacing permit even greater freedom when it comes to advanced use. Not only is the full Epson RX compatible control code set implemented, but extra codes have also been added to cater for the NLQ options, etc.

A full 96 ASCII character set is supported, with an extended set of 32 international characters and IBM special characters as well as IBM block graphics characters. A 1K Print Buffer alleviates much of the wait time normally associated with printing, whilst the bi-directional logic seeking print head takes the quickest route to print as required.

(Price inludes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

Special Price: **£149** (carr. £6)

Optional RS232 Interface: **£39**

Panasonic KX-P1082

To complement the hugely popular KX-P1081, WE are proud to announce the launch of Panasonic KX-P1082. This superb Letter Quality printer incorporates all the features of the KX-P1081, plus a draft speed of 160 CPS, (40 CPS in NLQ mode). Ideal for high through-put users. This is a similar speed to the Epson LX800, but has an in-built adjustable tractor feed as standard and the price is way below the price of its nearest rival.

(Our LOW price also includes £35 worth of FREE BBC Cable and Dump Out 3 ROM).

Introductory Offer: **£175** (carr. £7)

Panasonic KX-P3131 Daisy-Wheel Printer

This low-cost high-performance Daisy Wheel printer is ideal for anyone wishing to produce clear, immaculate letters or reports. It delivers, flawless text at 10, 12 & 15 CPS. Supports proportional spacing. Is Bi-directional, logic seeking. Printing speed: 17CPS. Has 6k printer Buffer. A printer of similar spec could cost a lot more than our ridiculously low price of:

Only **£239** (carr. £7)

Single Sheet Feeder	**£175**
Tractor Feed	**£90**

FREE 32K extra Printer Buffer with every KX-P3131 purchased from us this month.

VARIOUS PRINTERS & ACCESSORIES

Brother HR15 RS232 Daisy Wheel	**£275**
Brother HR20 Daisy Wheel	**£349**
Epson EX800 Printer	**£399**
Epson EX1000 Printer	**£545**
Epson FX800 Printer	**£295**
Epson FX1000 Printer	**£405**
Epson LQ800 Printer	**£358**
Epson LQ1000 Printer	**£529**
Epson LQ2500 Printer	**£790**
Epson LX800 Printer	**£180**
Epson SQ2500 Printer	**£899**
Epson Paper Roll Holder	**£17**
EX800/1000 Colour Option	**£55**
EX800/1000 Colour Ribbon	**£18**
EX800 Cut Sheet Feeder	**£130**
EX1000 Cut Sheet Feeder	£195
FX/LQ/LX800 Single Sheet Feeder	**£135**
FX/LQ1000 Single Sheet Feeder	**£169**
Hi-80 Refills – Set of 4 Pens	**£7**
LX800 Cut Sheet Feeder	**£75**
LQ800 Tractor Feed	**£44**
LQ1000 Tractor Feed	**£50**
LQ2500 Cut Sheet Feeder	**£195**
LX1000 Cut Sheet Feeder	**£305**
Hitachi 672 Colour Plotter	**£475**

(Securicor Carriage on Printers £7

EPSON PRINTER INTERFACES

All these interfaces fit inside the printer.

RS232	**£27**	RS232 + 2K Buffer	**£52**
IEEE 488	**£65**	RS232 + 8K Buffer	**£62**

KAGA/TAXAN PRINTERS

(IBM/Epson compatibles)

Kaga KP815 Printer	**£269** (carr £7)
Kaga KP915 Printer	**£350** (carr £7)
RS232 Interface	**£49**
RS232 Interface with 2K Buffer	**£69**
RS232 Interface with 16K Buffer	**£89**

INTEGREX COLOUR JET PRINTER

Colour Jet 132 Printer	**£525**
Paper Roll	**£6**
Screen Dump Software	**£10**
Colour Cartridge	**£14**
Black Cartridge	**£8**
100 A4 OHP transparencies	**£55**

PRINTER SHARERS

(Ideal for School environment)

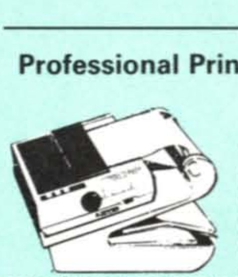
Connects	Serial	Centronics
2 BBC Micros to 1 Printer	£25	£27
3 BBC Micros to 1 Printer	£36	£35
6 BBC Micros to 1 Printer	–	£99

PRINTER CHANGER

3 Printers to 1 Micro (Centronics) **£65**

(Cables extra, specify type required when ordering)

Professional Printer Stand



This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

£26 (carr. £2.50)

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible Printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from BASIC and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

£5.95 (No VAT)

PRINTER LEADS

Centronics lead to connect BBC micro to EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA, Panasonic etc. printers.

Standard length (4 feet long)	£6
Extra long (6 feet long)	£8
Compact's Special Centronics Lead	£9
RS232 Cable	P.O.A.
IBM Parallel 1 metre Cable	£9

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
BBC Micro	–	£3.50
BBC Master	–	£4.00
Brother HR15/20	£3.00	£5.00
EX/LQ800	£7.50	£4.50
EX/LQ1000	£8.00	£5.00
RX/FX80/85/800/MX80	£4.00	£4.95
RX/FX100/1000	£7.00	–
Kaga/Texan KP810/815	£5.25	£4.00
LQ2500	£9.00	£5.50
LX80/86/800	£4.00	£4.50
M1009/GLP	£4.00	£3.75
Panasonic KX1080/81	£4.50	£4.75
SQ2500	£25.00	£5.50
Star NL10	£4.00	£4.50
Microvitec Metal	–	£5.50

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Listing Paper (Perforated)

1,000 Sheets 9½" × 11" Fanfold Paper	£7
2,000 Sheets 9½" × 11" Fanfold Paper	£12
1,000 Sheets 15" × 11" Fanfold Paper	£9
1000 Sheets true A4 Fanfold Paper	£11
2000 Sheets true A4 Fanfold Paper	£20
Teleprinter Roll (Econo paper)	£4

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50. 2K Sheets £3.00

PRINTER LABELS

(On continuous fanfold backing sheet)

1,000	90 × 36mm (Single Row)	£5.00
1,000	90 × 36mm (Twin Row)	£4.90
1,000	90 × 49mm (Twin Row)	£7.50
1,000	102 × 36mm (Twin Row)	£6.25

Carriage on 1,000 Labels £1.00

MEGABUFFER 256

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:

- Low Cost, High performance.
- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

Only £125 (carr £2)

OFFICE MASTER

CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

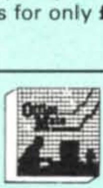
EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

OFFICE MATE



- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS

DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features.

BEEBPLOT – Provides visual representation from Spreadsheet data.

OFFICE MATE Only £10 (Disc)

New Launch Offers

Disc Drives DP35-800S

A Double disc drive – with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master Series is the 5.25 inch disk, the standard for the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.

To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S, it contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.

The 5.25 inch disk drive is 40/80 track switchable, and has its very own power supply running independently of the BBC Micro.

Watford's new plinth enables users to read, write and format disks both in DFS and ADFS format – currently the accepted standard for the Master Compact and the Archimedes, it also enables the user to read disks written for the Archimedes. Ideal for both BBC & Master.

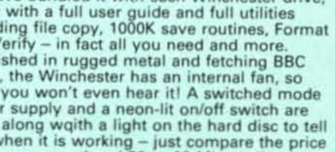
Launch Offer: **£165** (carr. £7)

CSPM 400/S DISC DRIVE

A single (1 Megabyte unformatted), double sided, 40/80 track switchable 5¼" disc drive mounted in a BBC Master Plinth (same as DP35-800S) but with a blanking plate to add a second disc drive at a later date. The in-built Power Supply is capable of running two disc drives. The unit is supplied complete with cables and a utilities disc.

Launch Offer: **£139** (carr. £7)

30 Megabyte Winchester Drive



Undoubtedly the best value for money Winchester Hard disc available anywhere for the BBC Micro.

This 30 Megabyte hard disc is completely compatible with the Acorn ADFS – that's why we have bundled it with each Winchester drive, along with a full user guide and full utilities including file copy, 1000K save routines, Format and Verify – in fact all you need and more.

Finished in rugged metal and fetching BBC beige, the Winchester has an internal fan, so quiet you won't even hear it! A switched mode power supply and a neon-lit on/off switch are there along wqith a light on the hard disc to tell you when it is working – just compare the price with our competitors' 20 or 28 Mbyte discs!

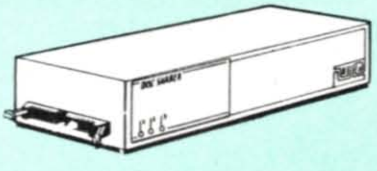
Compatible with the Master, and the BBC B (with 17"X disc interface).

Launch Offer **£449** (Carr. £12)

At last, it's here!
The Advance Reference Manual for the BBC Master
£19.95

NEW

DISC DRIVE SHARER



(Ideal for educational establishments)

At last, a low cost alternative to the Econet system. Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not compatible with ADFS.)

Launch Price: **£59** Price includes 3 Cables

NOW WITH EXTRA FEATURES AT NO EXTRA COST – Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

If you already have the Watford Electronics DFS and wish to incorporate these new facilities then simply return your existing DFS ROM to us together with £5 remittance for an upgrade. Please pack the ROM securely and address the package to our Upgrades Dept.

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for five years and has gained a large following amongst serious and educational users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. ***(P.S. Watford's highly sophisticated DFS is fully compatible with Acorn DFS). (not Acorn's 1770 DFS)***

- *Complete Disc Interface Kit including DFS ROM and fitting instructions* **£48**
- *Acorn's 0.90 DFS Kit complete* **£47**
- *DFS Manual (Comprehensive)* *(no VAT)* **£6.95**
  (P.S. Our comprehensive DFS Manual covers both Acorn & Watford DFSs).
- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *DNFS ROM only* **£17** ● *ADFS ROM only* **£25**
- *Watford's DFS is exclusively available from Watford Electronics and their appointed dealers only. Every ROM carries a special label with LOGO and serial number.*

NEW WATFORD's Mk II Double Density DFS INTERFACE

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our MkII DDFS board has been adapted to allow the use of Acorn ADFS.

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!

If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£30.00**.

- Special introductory offer **£39.00**
- DDFS Manual (No VAT) **£6.95**
  - We will exchange your existing DFS Kit for our sophisticated DDFS for only **£25.00**

Please note, as the MkII DDFS is a hardware and software upgrade, it is not possible for existing Watford DDFS users to simply exchange their ROM for the new version.

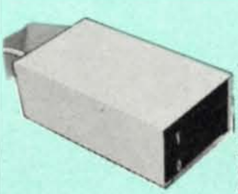
SPECIAL DISC DRIVE/DDFS OFFER

Type CLS400

- The popular Mitsubishi 400k Single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's popular DDFS Disc Interface (allows 720k storage). Will run in both Single and Double Density modes 40/80 track Software switchable.
- A comprehensive User Friendly Manual.

A Bargain at Only **£130** (£6 carr)
(Offer valid while stocks last)

3½" DISC DRIVE OFFER



These top quality 3½" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc. They run directly from the BBC B/Master's own PSU.

- Single 400K Drive **£69**
- Twin 800K Drives **£126**

Mysteries of disc Drives & DFS Revealed

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

Then The Mysteries of Disc Drives and DFS Revealed is the book for you. It explains in detail the different types of systems available, how they are installed and how to use them. Many examples are given including pre-written programs to call various functions of the DFS available only through Operating System calls. Different types of disc, 40/80 tracks etc. are all explained. This book is ideal for the beginner confused by the plethora of choice available in the marketplace.

£5.95 (Book No VAT)

DISC ALBUMS

Attractively finished in antique brown leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

£4

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. Available in 3½" & 5¼", please specify.

£7

ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

● **M35** - holds upto 50 5¼" discs	**£6.00**
● **M85** – holds upto 95 5¼" discs	**£8.00**
● **M25*** – holds upto 25 3½" Discs	**£5.50**
● **M50** – holds 50 3½" Discs	**£7.50**

* Not lockable

PLASTIC LIBRARY CASES

Holds up to 10 5¼" Discs. **Only £2.00**

DISC PLONKER RACK

When using ones micro, there is a tendancy to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk.

Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. It holds up to eight 5¼" Discs.

Protection at Only: **£2**

DUST COVERS (For our Disc Drives)

Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.

***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

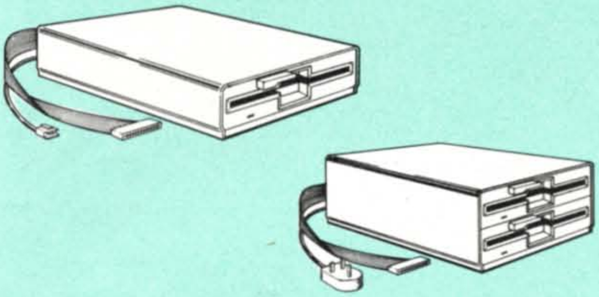
Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality JVC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 6th page of our advert for the Plinths).

P.S. All our 5¼" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.



Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £89		CS 200 £98	
400K (720K)	CLS400S £89	CLD 400 £168	CS 400S £99	CD400 £188
800K (1.44M)		CLD 800S £169		CD 800S £188

- TWIN Disc Drive Case, complete with Power Supply & Cables **£43**

Securicor carriage on Disc Drives £5 to £6

*Prefix **C** = Cased Drive*
***L** = Less PSU*
***S** = Single*
***D** = Double*

*Suffix **S** = 40-80 Switchable*

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5¼" 400K, (720K in double density); Double sided; 40/80 track switchable.

Cable to connect 5¼" Disc Drives to BBC Compact
Single £9 Twin £12
Special Cable to connect both 3½" and 5¼" Disc Drives simultaneously to the BBC Compact £13

3M – DISKETTES

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor.

● *10 × 5¼" S/S D/D 40 Track Diskettes*	***£8.25***
● *10 × 5¼" D/S D/D 40 Track Diskettes*	***£10.20***
● *10 × 5¼" S/S D/D 80 Track Diskettes*	***£12.75***
● *10 × 5¼" D/S D/D 80 Track Diskettes*	***£13***
● *10 × 5¼" 1.6M D/S D/D High Density Discs for IBM XT and AT*	***£28***
● *10 × 3½" S/S D/D 40/80 track Discs*	***£13.50***
● *10 × 3½" D/S D/D 40/80 track Discs*	***£19***

TOP QUALITY 3½" & 5¼" DISKETTES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs. Each Disc has a reinforced hub ring and carries a lifetime guarantee. These are supplied complete with selfstick labels and packaged in an attractive plastic library disc box to protect them from damage. We strongly recommend these Discs.

DON'T SETTLE FOR LESS, BUY THE BEST

● *10 × **M3** 3½" D/S D/D 80 Track Discs*	***£18***
● *10 × **M4** 5¼" S/S D/D 40 Track Discs*	***£6.50***
● *10 × **M5** 5¼" D/S D/D 40 Track Discs*	***£8***
● *10 × **M7** 5¼" D/S D/D 80 Track Discs*	***£9***
● *3" Double Sided Discs*	***£3** each*

Special BULK OFFER on 5¼" DISCS

PRICES SLASHED

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	**£35**	**£39**	**£45**
● With Sleeves	**£38**	**£42**	**£48**

ACORN WINCHESTER DRIVES

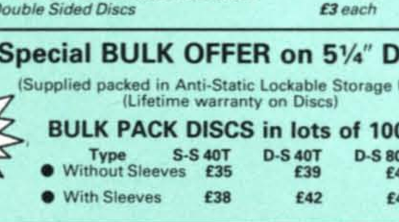
FILESTORE E01	**£825**
FILESTORE E20	**£705**
Acorn 30MB Unit incl. Level III Software	**£1520**

PRICES SLASHED

WATFORD's WINCHESTER DRIVES

● 10 Megabyte Unit with ADFS	**£399**
● 30 Megabyte Unit with ADFS	**£449**
● 40 Megabyte Unit with ADFS	**£749**

CDP800S



CDPM800S

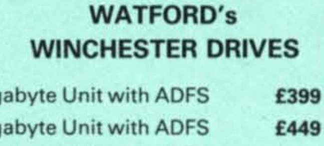
Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The switches are mounted on the front panel for ease of use.

CDP 800S for BBC Micro £192
CDPM 800S for Master £196

(Securicor Carr. £7)

(The above drive units are 2 Megabytes unformatted)

ACORN'S Twin 800K Disc Drives



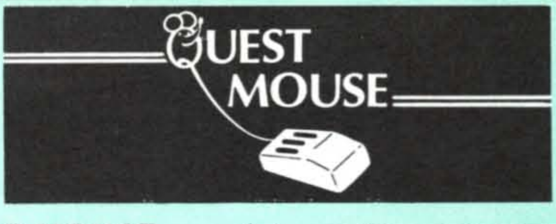
Specially mounted side by side in a Master Plinth. Supplied complete with Cables. Plugs directly to the Master Computer.

RRP ~~£350~~

Our Price: Only £182
(carr £7)

Continued →

NOMINATED FOR
MICRO
BRITISH COMPUTING
AWARDS
1987



QUEST MOUSE

The ultimate in Mouse technology, the Watford Electronics Quest Mouse must be the most powerful Mouse package yet produced for the BBC Micro. Featuring state of the art 32K ROM software the Quest Mouse package is filled with features essential to the budding artist. The Quest Mouse is a high precision, low profile and large footprint mouse. It has three large comfortable buttons and is smooth and easy to use on most work surfaces. The Quest Mouse is FULLY HARDWARE COMPATIBLE with the AMX MOUSE so that it will work with any of the AMX range of software.

The two parts of the Quest package are available separately so that existing Mouse owners can upgrade to the Watford's sophisticated Quest Paint software or replace their existing worn out mice for a minimum cost.

QUEST PAINT

The Quest Mouse software is supplied on a PALPROM unit to allow the sophisticated 32K program to be used from a single ROM socket. It is compatible with the BBC B, BBC B Plus and BBC Master Series machines.

The software is used to draw high resolution Mode 1 pictures in full colour. All menu selection and control of the drawing process is performed with the mouse so that you will hardly ever touch the keyboard.

SOFTWARE FEATURES

The software is far too powerful for us to describe it fully in such a small space. Below is a list of the various features. Please write to us for a fully descriptive leaflet.

Disk interface not required. Utilities disk has facility to create and print big screens. Colours applied can be solid, either pattern of user defined pattern. Drawing can use brush or airbrush. Brush shapes can be defined and stored. Airbrush sprays colour/pattern randomly with four jet sizes and even or center spread. Colour cycles. Colour protection to stop particular colours from being overwritten by selected drawing actions. All standard drawing facilities like: rubber, straight pencil lines, triangles, circles, ellipses, rectangles, parallelograms, polygons, etc are provided. All shapes can be solid or just a boundary line. Once a shape has been set up it can be repeated anywhere on the screen. Global colour replace in a rectangle. Powerful fill facility for areas and vertical/horizontal lines. Full cut and paste of rectangular areas with rotation and size with screens from Watford Beeb Video digitiser. Load and Save screens with colour pallet information, save brush and pattern definitions etc.

Take The Guesswork Out of Selecting a Mouse Package
With reviews like this how can you go wrong.

Popular Computing Weekly, 9-11 June '87
"What you actually get for your money is a well built, three button mouse (far superior to the AMX mouse)."
"Overall the combination of a quality mouse and decent art package gives Watford Electronics a real chance of supplanting AMX as mouse supremos."

Micro User June '87
"Quest Mouse and Quest Paint can hold their heads high in the market. . ."

A&B Computing June '87
". . . Watford Electronics, a company famed for excellent hardware add ons and versatile software packages. Called Quest mouse, "this is a very special mouse driven drawing package..."
". . . you will have one of the most comfortable and professionally built mice I have used in a long time. The buttons are responsive, the mouse movement is smooth and without directional bias – a pleasure to use."
"What we have here is probably the best art package there is for the BBC Micro . . ."
"Quest Paint is a major leap forward in BBC programming. . ."
"Quest Paint is an original piece of programming, it is friendly and well endowed with many useful facilities. I would comfortably say it is easier to draw good pictures with Quest Paint than it is with more expensive 'Professional' art packages for the Atari ST and the Commodore Amiga. A recommended buy if you are looking for the best in BBC micro based art packages".

Acorn User, September '87
"The mouse (Quest) performs well in the face of competition from AMX, Wigmore and the rest . . ."
". . . this package represents excellent value for money. If you are interested in art then this program is for you to buy".
"Given time, I can see no reason why Quest Paint shouldn't take on the title of the definitive art package available for the BBC Micro to date".
"All in all, Quest Paint is a very professional package. It contains virtually every feature the budding artist could require".
"What makes Quest Paint so versatile is the addition of a sub-menu which allows you extensive control over each function".
"Until recently, Superart from AMS had been judged as the definitive mode 1 graphics package for the BBC micro. But now it has a serious rival in the form of Quest Paint, from Watford".
"As a measure of what is contained within Quest Paint, I would say it had all the features of Superart plus . . ."
"In most art packages, provision is given for drawing triangles and rectangles. Quest Mouse goes 14 better, allowing any regular polygon of upto 16 sides".
"One facility, not found on any other Art package to my knowledge, is the ability to access a digitiser from within the program".
The reviewer concludes by saying, "The result is an extremely comprehensive and professional art package".

John Kilby, Head of Computer Science, Bishop Wulstan High School, Rugby, writes:
"Quest has been an excellent piece of equipment. The problem that seems to occur everyday is that at lunchtime the pupils rush to the computer room to make sure that they are first in the queue for the 'Quest' mouse".

Lt. Cln. C.G. Holton, G2 HQ 1 (BR) Corps, BFPO 39, writes:
"As ever your service is superb and the Quest Mouse proves every bit as good as the adverts claim".

Beeblet User Group, New Zealand Oct '87:
"One of its nicer features is that the top menu is done in Mode 0, the drawing itself is in Mode 1. Thus on screen together are two different Modes. A neat way around an old problem".

"PAN is used when a larger than one screen size image is required. The mind boggles at an A3 size drawing".

"I like it partly because of the mouse itself which is smooth and easy to handle but mainly I suppose because of the features I longed for and previously never got. Its easy to use with almost everything at your fingertips from the mouse. The software is simple where needed and complex where complexity is required".

ConQuest

Watford's Quest package is an extremely powerful and flexible drawing package, with very wide and unusual features. However, since its launch various suggestions for even more advanced & powerful facilities were received from the Quest users. ConQuest allows you these more advanced facilities, like, distortion of a cutout to any shape and a full font designer. If you also have a GXR ROM in your machine or you are using a BBC Master then ConQuest will take advantage of this to give ellipses at any angle, sectors and arcs, etc. Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.
Some of the features are:

- Pick filenames off the screen for loading and saving.
- Rotate a cutout to any angle and Distort it to any four sided shape.
- Has Built in Font editor.
- Default brushes and patterns on startup.
- 16 x 16 font available on start up.
- Ability to reset patterns, fonts and brushes to default at any time.
- ROM based enhanced Epson and compatible printer dump.
- ROM based enhanced extended picture routine.
- Ability to create and abort extended pictures.
- Improved disk access speed for extended pictures.
- User definable sideways RAM driver for incompatible sideways RAM systems.
- Ellipses at any angle on Master 128 (or B with GXR ROM).

QUEST MOUSE & QUEST PAINT	**£59**
QUEST MOUSE, QUEST PAINT, AMX PAGEMAKER & PAGEFONT	**£85**
QUEST MOUSE ONLY	**£29**
QUEST PAINT SOFTWARE	**£32**
QUEST FONT DISC	**£12**
ConQuest 32K ROM Package	**£29**
QUEST MAT	**£3**
Part-exchange your old Mouse for a New QUEST MOUSE for only	**£23**
GXR ROM for BBC Micro	**£22**

N.B.
1. Quest Paint supplied complete with Software in a 32K ROM, Comprehensive User Guide and a Utility Disc.
2. Quest Font Disc has 22 text FONTS for use within Quest Mouse.

MARK II LIGHT PEN

Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted.

Price Only £21
(Price includes FREE software Disc and Operating Manual)

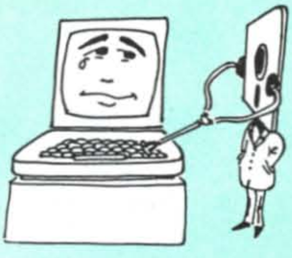
RB2 Marconi Tracker Ball

RB2 (AMX/Quest compatible)	£59
RB2 including Quest Paint	£85

FLEET STREET EDITOR

Software pack for BBC Micro	**£31**
Software pack for the Master	**£39**
Software Pack for Compact	**£40**
Admin Xtra Disc Utility	**£13**
Walt Disney Disc Utility	**£13**
Fonts N Graphics Disc Utility	**£13**

DIAGNOSTICS DISC



The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult. At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

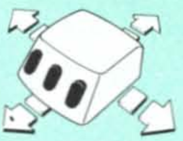
The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

This utility is an invaluable aid*for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

THE NEW Mk III AMX MOUSE



ONLY: £59 **Inc. Super Art package**
(carr £1.50)
(Please specify for BBC, Master or Compact)

FREE our popular Colour Art software pack worth £15 with every AMX Mouse package purchased from us.

AMX MAT	£3
AMX MOUSE ONLY	£29
AMX DESK Package	£19
AMX UTILITY Package	£11
AMX SUPERART Package	£39
AMX STOP PRESS – A Desktop publising software. Works with Keyboard, Joystick or a mouse	£32

We are giving away absolutely FREE, our PAGE-FONT disc with every purchase of STOP PRESS from us.

PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker	£9.50

AMX DESIGN (ROM)	£59
AMX 3D ZICON Disc	£19
AMX Database Disc	£19
AMX XAM Educational	£15
AMX EXTRA EXTRA	£19
AMX MAX A gem of desktop (ROM)	£15

TED

THE ULTIMATE TELETEXT SYSTEM

TED is one of a new generation of powerful 32K ROMs for the BBC B, B+ and Master computers and is compatible with disc, tape and network systems. It is in everyday use in schools, colleges and universities, Programmers, Prestel I.P.'s, Micronetters and exhibitors have also found it indispensable.

TED includes the most comprehensive teletext (Mode 7) screen editor ever written for the BBC micro, combining flexibility with ease of use. Its sophisticated facilities include line, column and block copying within AND between frames; text, in a variety of styles and sizes, entered directly from the keyboard; graphics and line drawing modes; search and replace; margins; printer dump routines and a library of in-built icons and typefaces. TED will edit ANY mode 7 screen and can even convert high-res graphics screens to mode 7! Included within the ROM is a fully Epson compatable mode 7 graphics dump routine giving a grey scale printout of exactly what appears on the screen.

Using '*SHOW' (a versatile carousel), collections of mode 7 screens may be 'routed' or displayed sequencially, making it ideal for creating and running 'Viewdata' information systems. Over 1200 frames may bestored on a twin 80 track drive. A unique feture of TED is '*SCROLL', which lets you create pages of up to 600 lines which may be viewed 'Wordwise style', automatically or manually. SHOWs and SCROLLs may be freely mixed and even used from within a BASIC program.

The package comprises a 32K ROM, a 117 page manual, a function-key strip and a demonstration disc containing examples of real-time animation and a sample 55-frame database. A stand-alone machine code routine is provided allowing SHOWs and SCROLLs to be displayed on machines not fitted with TED.

Price: £35

ROM-SPELL

ENGLISH DICTIONARY
ROMSPELL

Probably the most advanced and fastest spelling checker available for the BBC Micro. Compatible with View, Wordwise and Wordwise Plus ROMSPELL is simple to use with easy editing of incorrect words. Full facilities for editing the user dictionary to allow customisation to your personal needs. Dictionary includes over 30,000 words and is supplied with a Comprehensive manual.

NOT compatible with 1770 DFS.
(Please state 40 or 80 track disc)

Price still only: £25

ROM MANAGER

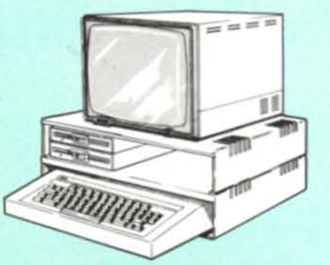
ROM
MANAGER
DFS

Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs. Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.

"Provides comprehensive management of all your installed ROMs". (BEEBUG November '84.)

ONLY £20

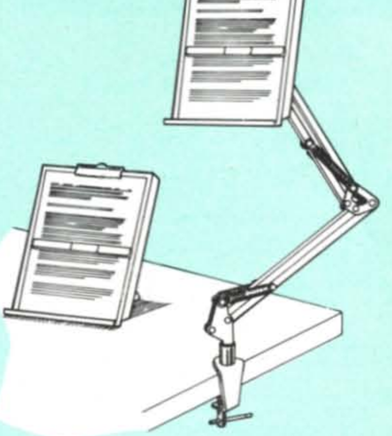
PLINTHS FOR BBC MICRO, MASTER & PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	**£11** (carr. £1.50)
DOUBLE BBC PLINTH	**£19** (carr. £3.00)
PRINTER PLINTH	**£10** (carr. £1.50)
SINGLE MASTER PLINTH	**£14** (carr £1.50)
DOUBLE MASTER PLINTH	**£24** (carr £3.00)

COPY HOLDERS



How often have you been about to type hand written notes into your computer when you find that there's nowhere to rest the paper or that your notes are resting at the wrong angle to read the type? Whether the notes be your latest program or the draft of a new trilogy, the new Manuscript Holders from Watford are superb for holding your paper at the ideal height and angle to allow you read and type in ease and comfort.

Available in 2 versions, desk resting and shelf clamping versions, these two units hold your paper firmly by means of a plastic retaining ruler and a clip grip. Both units are full A4 size.

Amazing value at only
Desk Top **£10** (carr. £2)

Angle poise **£14** (carr. £3)

Continued →

ARIES CORNER

The Aries B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

Price: **£80** (carr. £2)

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

VISA

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries-B20 and the Aries-B32

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable "mother board" which carries the extension ROM sockets and a small "base board" on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost.

Price:		
Price:	Aries B-12	**£40**
	Aries B-12C	**£5**

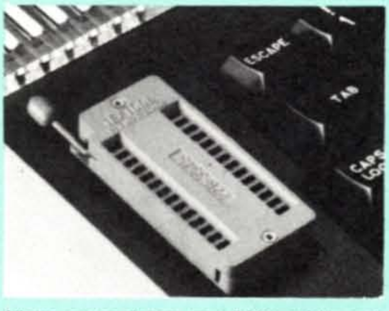
ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238 (Carr £3)

All prices in this advert are exclusive of VAT.

SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£15** (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

● Complete System	**£11**
● Spare Cartridges	**£2.50**
● Spare Rack	**£1.50**

16K Sideways RAM Modules

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

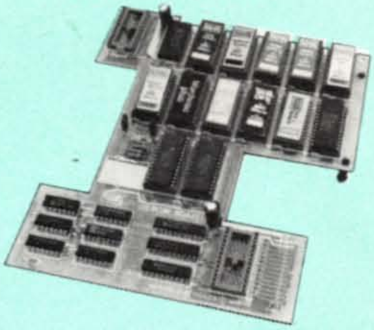
- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£24** (carr £2)

Optional extras

READ and WRITE protect Switches **£2** each
Battery for Battery Backup **£3**

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

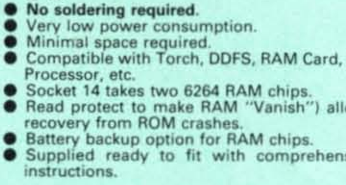
- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£36**
(carriage £2)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: £8

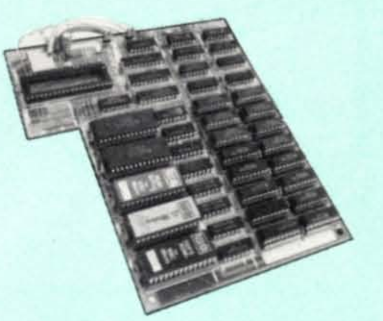
USER PORT SPLITTER UNIT



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaniously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination.

Excellent Value at **£21**

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

INTRODUCTORY PRICES:

● ROM/RAM card with 32k dynamic RAM	***£39***
● ROM/RAM card with 64k dynamic RAM	***£52***
● ROM/RAM card with a massive 128k dynamic RAM	**£80**

(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

● 16k plug-in Static RAM kit	**£6**
● 16k Dynamic RAM for Upgrade	**£7.50**
● Battery backup	**£3**
● Read and Write protect switches	**£2** each
Complete ROM-RAM board All options installed	**£89**

P.S.

Is your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford ROM/RAM Board and pay £10 less

Le Modem

The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World-wide data transfer system.*
- *Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*
- ***FREE Registration to MicroLink.***

SPECIAL OFFER

Price: ***£94***
(carr £3)

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

Minerva Systems Software

System Delta with Card Index	£55
System Programmers Ref. Guide	£19
System Gamma	£43
System Gamma Prog, Ref, Guide	£19
System Mailshot	£17
System Reporter	£17
System Intrer/View Link	£17
System Sales Ledger	£39
System Purchase Ledger	£39
System Nominal Ledger	£48
System Stock Management	£39
Order Processing/Invoicing	£39

APOLLO

The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- **FREE Registration to MicroLink.**
- **£6.50 off annual Membership to Micronet, Prestel and Telecom Gold.**

The Apollo is attractively finished in matt black. It opens the doors to world communication to both, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution – Buy a Watford APOLLO!

Only: **£94** **(Carr £3)**
Price includes, the Modem, Comm Software Cables & Operating Manual).
(Write in for full specification)

Nightingale Modem

SPECIAL PRICE to our Customers

£82

(Price includes: Nightingale Modem, Commstar ROM pack & Comprehensive manual)

Nightingale Modem without software	**Only £75**
COMMSTAR ROM package only	**£29**

(P&P on modem £3.00)

Versatile **BEEB SPEECH SYNTHESISER** Unit

Beeb Speech Synthesiser

The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

Continued →

COMPUTER CONCEPT'S ROMS

ACCELERATOR	£48
CARETAKER Basic Utility	£25
DISC DOCTOR	£28
Graphics ROM	£23
TERMI	£25
COMMUNICATOR	£49
SPEECH ROM	£24
Printmaster	£24

Wordwise £24

Wordwise plus £40

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS DISC: **£5**

SPELL MASTER **£45**

Inter SHEET ONLY £37

INTER-CHART ONLY: £26

Inter-WORD **£39**

MEGA-3 ROM

Interword, Intersheet & Interchart – 3 in one ROM **£85**

INTERBASE **£55**

All Prices Exclusive of VAT

VIEW

VIEW WORDPROCESSOR 2.1	**£35**
VIEW 3.0 ROM	**£48**
VIEW PROFESSIONAL	**£79**
HI-VIEW (for use with 6502 2nd Processor)	**£36**
VIEW Printer Driver Generator (Please specify Disc or Cassette)	**£9**
VIEWSHEET (Acornsoft)	**£37**
VIEWSTORE	**£37**
VIEWSPELL with 80 track disc	**£29**
VIEWPLOT Disc (Please specify for Master 128 or Compact)	**£22**
VIEW-INDEX	**£12**
OVERVIEW Packs 1 & 2 for the Master	**£75**

Watford's own Sophisticated VIEW PRINTER DRIVERS

Epson FX80 & Kaga KP (Disc)	£8
Juki & Brother HR15 (Disc)	£8
Silver Reed Printers (Disc)	£8

Micros in Business (Disc)

An introduction to Business software for the BBC Micro from Acorn **£43**

ADVANCE COMPUTER PRODUCTS' ROMs

Adv. Disc Toolkit	£29
Adv 1770 DFS for Mast/Compact	£29
Adv 1770 DFS for BBC/BBC+	£29
Adv Disc Investigator	£24
Adv. Control Panel	£29

MINI OFFICE II

Disc Version	£14.50
ROM Version	£47.00

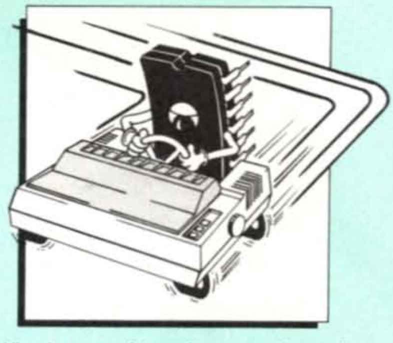
REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£13 (40 or 80 track)

Acorn's Speech Synthesiser package, complete
Special Offer £18

VIEW PRINTER DRIVER ROM



View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

EPSON NLQ ROM
for the BBC Micro

Harness the full potential of your Epson RX or FX printer. The NLQ ROM makes Epson printers produce Near Letter Quality output with optional proportional spacing, enlarged and underlined. Accessed by simple * commands from Basic, Wordwise and View (with driver) or almost any other language.

(Send an SAE for sample printout)

Only: £25

VIEW PRINTER DRIVER for NLQ ROM **£7**

DUMPOUT 3

A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including full Mode 7 graphics.
Also provided are window setting utilities and OSWORD calls to plot and read Mode 7 graphics pixels.

Facilities:

- Vertical and horizontal scaling in all graphics modes and mode 7
- Rotation of image by 90, 180 or 270 degrees
- Left hand margin setting
- Screen dump window setting
- Colours appear as grey scale
- Two tone fast dump
- Colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered and User Port triggered dumps

The Micro User Feb. 1985.
'Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC Micro . . . it must represent excellent value for money and surely cannot be beaten".

For use with the following printers:

GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Panasonic KX1081/82, Mannesman Tally and compatibles.

Only: £25

BBC SOFTWARE'S
Popular Educational Software

Maths with a Story 1 (Cassette). 4 primary level maths programs	£9.95
Maths with a Story 2 (Cassette) 4 further maths programs	£9.95
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RELATIONSHIP: Science (Disc) O Level Biology program.	£14.95
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ELECTRONICS IN ACTION (Disc) O Level program	£14.95
NEWTON & THE SPACE SHUTTLE (Disc) O Level program.	£20
ECOLOGY (Disc) O Level program.	£20
POLYMERS (Disc) O Level program.	£20
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DEUTSCH DIREKT! (Disc & Audio Cassette)	£20
Modem Master (Disc)	£11.25
ADVANCED TELETEXT SYSTEM	£9
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USING YOUR COMPUTER (Cassette) 8-12 age	£24
Astronomy – Primary Disc	£11
Computers at Work – Primary	£16
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Electric Fields 6-14 years	£10.50
Statistics A level	£23

THE NLQ DESIGNER

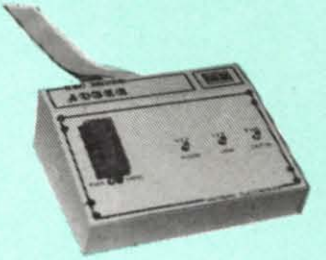
(The First & still the Best)
Supplied with over 25 Different fonts

A massively useful utility for users of the Taxan/Kaga KP810/910 or the Canon PW1080. This program allows you to define NLQ character sets to download into the printer's memory. Full on screen editing of the font. Requires 6264 RAM chip to be fitted in the printer.
Supplied with disc containing over 25 example fonts. (Please specify 40 or 80 track when ordering.) Fonts are: Italic, Courier, Courier Italic, Script, Copper Plate, Shadow, Bold, Double Print and Gothic etc. (P.S. This ROM is not suitable for Epson printers.)

- NLQ Designer ROM, FONT Disc and Manual **£25**

(Write in for further details on all above ROMS)

ADDER



The only low cost EPROM Programmer for the BBC Micro that will program both the standard 21V and the new 12V5, 27128 EPROMS.
Adder is the ultimate EPROM programmer for the BBC Micro. It will program many different EPROMs up to the very latest 27256 32K devices.
The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.
The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.

Features:

- Two ultra fast programming algorithms or standard slow algorithm.
- Supports standard 21V programming and newer 12.5 volt EPROMs. (Software switched).
- The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.
- Automatic processing to handle a list of files to program into the EPROM.
- Automatic disc buffering to allow programming of 32K 27256 devices from a 32K file without extra effort.
- Verification gives detailed error list and checksums are maintained. There is also a blank check facility.
- Works with all standard filing systems. Generates header code for RFS ROMs to allow Basic programs etc. to be stored in EPROM. More than one file per ROM permitted.
- Programs the following EPROMs: From 2K to 32K: 2516, 2716, 2532, 2732, 2764, 2764A, 27128, 27128A, 27256 (Both 12.5V and 21V).

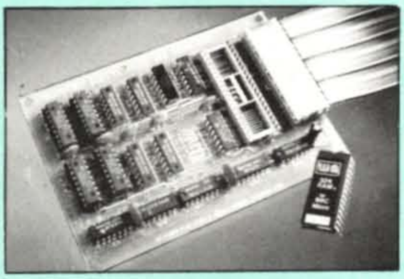
£75 (£3 Carr)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. **£28** (carr £2)
- **ERASER GT** – Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30** (carr £2)
- Spare UV tubes. **£9**

32K
SHADOW RAM-Printer Buffer
Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.

- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.

- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.

- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

- Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.

- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

INCREDIBLE WORDPROCESSING DEAL

Watford's 32K SHADOW RAM CARD and Computer Concept's INTERWORD Wordprocessor package.

at Only **£89** (carr £2)

Continued →

BOOKS (No VAT on Books)

15 Hr Wordprocessing BBC/View	£4.95
15 Hr Wordprocessing BBC/WW & WW+	£4.95
30 Hour BASIC (BBC Micro)	£9.95
40 Best machine Code Routines	£7.95
50 Programs in BBC BASIC	£6.95
6502 Assembly Language Program	£19.95
6502 Application	£11.95
6502 Assembly Lang. Subroutines	£19.95
6502 Development Package	£7.50
6502 Reference Guide	£10.95
68000 Assembly Language Prog.	£19.95
68000 Machine Code Programming	£13.00
68000 Microprocessor Handbook	£14.95
68000 Programming the	£22.95
68000 User Guide	£8.95
6809, Programming the	£16.95
6809 Machine Code Programming	£7.95
8086/8088 Assembly Language Prog.	£11.95
8086/8088 Programming the	£16.95
Advanced Disc User Guide	£16.95
Advanced Prog. Guide to BBC	£9.95
Adv. Sideways RAM User Guide	£10.95
Advanced User Guide for BBC	£10.95
Advanced Graphics with BBC	£10.95
Assembly Language Programming on BBC Micro	£11.50
Adventure into BBC BASIC	£6.95
Amiga Hardware Ref Manual	£23.70
Applied Assembly Lang. for BBC	£9.95
ARM Assem, Lang, Programming	£12.95
Art of Microcomputer Graphics	£15.95
Assembly Language Programming FOR the BBC Micro	£9.50
Assembly Lang. within BBC	£11.95
Basic ROM User Guide	£11.95
BBC B Compendium	£5.95
BBC BASIC for Beginners	£7.95
BBC Forth	£7.50
BBC Hardware Projects	£8.95
BBC Micro & Small Business	£5.75
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BBC Micro Disc Companion	£8.95
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CP-M Bible	£16.50
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CP-M Plus Handbook	£13.95
CP-M Soul of	£16.50
CP-M The software BUS	£8.95
Disc Drive Projects for Micros	£5.45
DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
DBASE Programming Language	£14.95
dBase III Plus	£12.95
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View Guide	£4.50
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VIEW incl. ViewSpell & ViewIndex	£12.95
Viewsheet User Guide	£10
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Wordstar & CP/M made easy	£9.95
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Z80 Applications	£15.95
Z80 Assembly Language Prog.	£19.95
Z80 Reference Guide	£9.95

NEW

THE COMPLETE BBC COMPUTER USER HANDBOOK

"Why has no-one written a book like this before? It's long overdue".

If you own a BBC-B, BBC B+, Electron, Master 128, Master Compact or Archimedes then this book is for you. It shows you how to get the most from your computer, and how to make the computer work for you. Although some sections are machine specific, most of the information, programs, hints and good solid experience are for the whole range of BBC machines. The general style and level means that both beginner and expert will feel satisfied with the quality and quantity of the material.

GENERAL – Uses and abuses of computers.

HARDWARE – How to design your own work station. Hardware additions (disc drives, ROMs, printers, 2nd processors, etc). DIY alterations.

HARDWARE RUNNING BBC-BASIC – All BBC machines are described with their differences. Compatibility between the various BBC machines. Networks. The Archimedes and its advantages.

GETTING ORGANISED – so that you keep track of your programs and control of your software. Setting up for easier programming sessions.

NEAT PROGRAMMING – Good style. Writing structured programs. Getting the best from BBC-BASIC, Graphics and screen displays. Speeding up programs. Saving space.

GENERAL PROGRAMMING TIPS AND HINTS – with a multitude of examples (eg input vetting, dealing with dates, blanking out function key messages, error trapping, disabling ESCAPE and BREAK, use of EOR with colour, etc).

DEBUGGING – Specific errors and how to handle them. How to test programs fully.

STANDARD PROGRAMS – Assessing word-processors, spread-sheets, databases, graphics packages, communications etc. How to customise them to your own requirements.

COMPUTERS AT HOME AND IN THE OFFICE – Introducing the computer to the office. Program protection. Computers and the law. Communications. Selling your own programs. 28 FULL CHAPTERS, elegantly written and extensively indexed. To dip into, consult, or read from cover to cover, again... and again... and again...

Only: **£14.95**

BEEB VIDEO DIGITISER

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package is designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROM's to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£109 (Carr. £3)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)
(BBC B+ and Master compatible, except Master with Econet)

Magazine Maker

(As seen on TV)

A combination of the Pagemaker and Watford's Beeb Video Digitiser.

Using any video that provides a composite signal and the digitiser, images from a camera or TV can be converted into a graphics screen on the BBC Micro.

They can then be used within Pagemaker to illustrate magazines or newsletters – in fact anything that needs to be created on A4 size paper.

With Pagemaker's many features, a variety of pictures can be composed – the only limit being the imagination.

Pictures can be doctored using Pagemaker's graphics option to produce any number of effects.

Text can be formatted around the digitised photo on screen using the facilities available, which include 16 typefaces, character and pattern definer, text formatting and the ability to load in wordwise and viewfiles plus much more.

Once created the picture can be printed out.

The Magazine Maker is suitable for any use that requires illustrated documents.

Complete Package **£135.00** (carr. £3)

SURGE PROTECTOR Plug

Fitted in place of your normal mains plug, this device protects your equipment against mains surges. Nearby lightning strikes, thermostats switching and many other sources which put high voltage transient spikes on to the mains. This can lead to data corruption in memory and on disc and can result in spuriously crashing machines. A must for every computer user.

Protection for only **£7.50**

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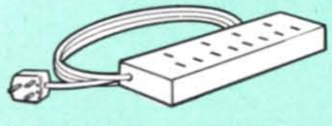

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High-octane graphics

Turbocharge your screen displays with Chris Nixon's compiler for graphic-based commands

A COMPILED program runs much faster than an interpreted one but, because they are exceedingly difficult to write, Basic compilers are few and far between, and usually pretty expensive – Basic just wasn't designed to be compiled.

If this casts you into a gloom of despair, never fear – here is a program called MiniCom, which will give you a taste of what it is like to compile a Basic program.

Before continuing, I must make clear that MiniCom is not a full compiler: That would have to be in machine code and probably fill the pages of this magazine. You can still do quite a lot with it though, and it does produce 100 per cent pure machine code – not the pseudo-compiled intermediate code of some other programs.

I have subtitled it a Graphics Compiler as it provides no variables, loops, jumps or branches of any kind. Instead it allows 16 commands normally associated with producing graphics, letting you create your title screens in machine code for extra speed, compactness and versatility.

A graphic layout thus created may be called from Basic or machine code very quickly, and takes up much less room than any equivalent Basic program.

And there is more scope for producing quick designs than it may at first seem, as I have added a few extra commands to those normally available from Basic. Table I shows a full list of MiniCom keywords complete with their syntax.

MiniCom is written in Basic and all program lines must be entered from its Command Mode, which resembles Basic's front-end.

The compiler uses the same line input as Basic, allowing full cursor editing.

Listing, loading and saving your MiniCom source files are also identical in operation to Basic, and the MiniCom commands even use identical syntax – apart from PRINT, TAB, SQUARE and FILL, which I will cover shortly.

There is no renumber command, but if

COMMAND	PURPOSE	PARAMETERS
CLG	Clear graphics window	None
CLS	Clear text window	None
CSR	Turn cursor on or off	1 or 0
COLOUR	Set text colour	Colour
DRAW	Join two graphic points	x,y
GCOL	Set graphic colour	Graphic mode, colour
GWIND	Set graphic window	x1,y1,x2,y2
MODE	Set screen mode	Mode number
MOVE	Move graphics cursor	x,y
PLOT	General purpose graphics	x,y
PRINT	Print text	String of text
SQUARE	Draw filled 4 sided shape	x1,y1,x2,y2,x3,y3,x4,y4
TAB	Move text cursor	x,y
TWIND	Set text window	x1,y1,x2,y2
VDU	General purpose output	String of VDU codes
FILL	Semi-fill area of screen	x,y

Table I: List of MiniCom keywords and their syntax

What is a compiler?

THE Basic programming language has come under a lot of flak in recent years from those who believe either it is too slow, or that it acts as an encouragement for unstructured programming.

The latter viewpoint is patently foolish – especially where BBC Basic is concerned. Its legendary speed and use of structure – partly borrowed from Pascal – is unrivalled in both the small and large computer markets.

There is some merit to the first point, however. Although it's probably the fastest version of Basic available on any home micro, BBC Basic – like any *interpreted* language – cannot match the speed of a *compiled* language such as C, Pascal and so on.

The reason for this is inherent in the meaning of the terms *interpreted* and *compiled*. An interpreted language is designed so you can enter instructions in a form closely resembling plain English.

Each program line is broken down as soon as it is entered, and stored as a sequence of single-byte *tokens*, which represent the keywords – such as PRINT – you originally typed in full. Any parameters or text associated with a particular keyword are stored in their original form after the relevant token.

When run, the interpreter – itself a complex machine code program – begins scanning through the tokens and their parameters, translating them and carrying them out. Once a particular instruction has been executed, the interpreter passes to the next one.

Furthermore, each instruction must be re-interpreted each time the program flow loops back to it.

Interpreters are used because execution can be stopped at any stage, with the original program still in memory, facilitating instant editing. Compilers, however, offer no such facility.

Using a compiler is a much more powerful method of programming. Like Basic, commands are entered in a form which is very close to plain English. The real difference is only apparent when it is time to run the program.

The compiler starts scanning through the text as before. But instead of being executed, a machine code translation is generated and stored as part of a growing heap of compiled code.

When compilation is finished, the resultant stack of code is a fully independent machine code program in its own right – and can be stored on disc for future use and run independently of the compiler.

As you can see, because the output of a compiler is pure machine code, it is many times faster than an equivalent interpreted program.

you find one necessary, simply save your program and load it again. This will renumber it from line 10 in steps of 10.

Type in Program I – the full listing of MiniCom. Save it as anything you like – but don't try and use it before you have saved it.

All MiniCom commands must be on separate lines, but you can forget unnecessary spaces just as in BBC Basic. To compile your finished masterpiece simply type COMPILE.

You will be asked for the address you would like the code to be assembled from – this may be anywhere in the program area ram, as MiniCom assembles using Basic 2's offset option. If you are unsure, type &1900 – the safest value to choose.

MiniCom will then begin compiling, and will show you when each of the two assembly passes BBC Basic makes is taking place. If MiniCom finds an incorrect number of parameters after any keyword, compilation will be aborted and you will be informed of the offending line's number.

When compilation is complete, MiniCom shows you the total number of bytes used. This may be more than you expect – especially if your program was a short one – because a short subroutine is always tacked on to the end of the compiled code to allow it to run independently.

If the command FILL is used, a further subroutine which does the filling will also be tacked to the end of the code. However, this is only done once. These extra subroutines are similar in function to the Basic rom, which executes all Basic commands, as it would be unfair to expect MiniCom to produce 100 per cent independent machine code without having its own mini-rom attached to the code.

But as long as your program is of a reasonable length – more than 20 lines – the space used will still be insignificant compared to that used by an equivalent Basic program.

To save your compiled code, type:

```
CSAVE"filename
```

In all loading and saving, Minicom allows you to forget the last quote if you wish. Your program may now be *RUN as a full machine code program.

All operating system star commands are allowed from MiniCom's command mode, and this makes for a little bit of fun.

An interesting experiment that I have tried is to *SPOOL an existing Basic program which already conforms to the structure required by MiniCom – no multi-statement lines and MiniCom specific commands only – and *EXEC it after entering MiniCom.

After compilation it is great fun to watch what was a true Basic program transformed into pure machine code!

COMMAND	PURPOSE	PARAMETERS
LOAD	Load MiniCom program	"filename(")
SAVE	Save MiniCom program	"filename(")
CSAVE	Save compiled machine code	"filename(")
LIST	List all or part of program	((1st),(2nd))
COMPILE	Compile program	None
HELP	List all keywords	None
NEW	Clear program from memory	None

Table II: List of MiniCom direct commands

MiniCom's special commands

MiniCom allows all text strings to be entered into PRINT commands without quotes. Indeed, if quotes are used they will appear on screen when the finished program is *RUN.

TAB must be used by itself and on a separate line from any PRINT statement. This should make sense to machine code programmers, as TAB simply places the text cursor at the position specified by the next two parameters.

The SQUARE command draws a filled four-sided polygon, taking four parameters which must be in the form: Top left, top right, bottom left and bottom right – or strange graphical effects may occur.

The CSR command allows you to turn the text cursor on or off using a parameter 1 or 0.

Finally there's FILL, which is not a true fill for the same reasons that MiniCom is not a full compiler – namely space. It will fill all regular shapes, and even irregular ones can be catered for if used at several points in the shape.

Type in the demo – Program II – from within MiniCom, compile it and *RUN the result. You may like to try and write a Basic program which is as fast and compact.

Although the program is fully error trapped, disc users may occasionally receive the message "Can't extend" when trying to save. Simply save your program to another disc, delete the old file, compact the disc, then copy the file back on to it.

Minicom will work with any BBC Micro, cassette or disc based, with Basic 2 or later. This includes the B+, Master 128 and Master Compact. Type *BASIC followed by REPORT to ascertain which Basic you have.

Users of the standard BBC Micro will lose the use of function keys and user-defined characters while in MiniCom, but these will be unaffected by the actual *RUNning of compiled code.

```
   10 REM MiniCom
   20 REM Graphics Compiler
   30 REM By Chris Nixon
   40 REM (c) The Micro User
   50 REM
   60 ONERROR GOTO1200
   70 MODE7:PROCSETUP
   80 PROCINPUT:GOTO80
   90 DEFPROCSETUP:FORY%=0TO1:PRINTTAB(3
,Y%)CHR$141CHR$129CHR$157CHR$131"MiniCom
 Graphics Compiler  "CHR$156:NEXT
  100 PRINTTAB(12,2)CHR$133"By Chris Nix
on"TAB(8,3)"(c) The Micro User 1987"
  110 PRINTTAB(0,4)STRINGS(40,"-");
  120 VDU28,0,24,39,5:MAXCOM%=16:col=&77
  130 !&C00=&B00:?&C02=78:?&C03=32
  140 ?&C04=127:MAX%=0:MAXLIN%=1000
  150 DIM L$(1000),K$(MAXCOM%),parms%(20
),L%(MAXCOM%):FORL%=1TO MAXCOM%:READK$(L
%):NEXT:FORL%=1TO MAXCOM%:READL%(L%):NEX
T:base%=&6000:PROCNEW:ENDPROC
  160 DEFPROCINPUT:VDUASC"]"
  170 A%=0:X%=0:Y%=&C:CALL&FFF1
  180 PROCINTERPRET:ENDPROC
  190 DEFPROCINTERPRET
  200 L$=$&B00:V%=VAL(L$):IF V%=0 PROCDI
RECT:ENDPROC
  210 IF V%>MAXLIN% PRINT"Line number to
o big.":ENDPROC
  220 IF L$=STR$V% L$(V%)="":ENDPROC
  230 BASE%=LENSTR$V%+1
  240 F%=0:FORL%=1TO MAXCOM%
  250 PT%=INSTR(L$,K$(L%),BASE%)
  260 IF PT%>0 F%=L%:T%=PT%
  270 NEXT:IF F%=0 PRINT"Unknown keyword
.":ENDPROC
  280 L%=T%+LENK$(F%)-1:REPEAT:L%=L%+1:U
NTIL MID$(L$,L%,1)<>" "
  290 T$=CHR$(F%+64)+" "+RIGHT$(L$,LENL$
-L%+1)
  300 L$(V%)=T$:IF MAX%<V% MAX%=V%
  310 ENDPROC
```

Turn to Page 117 ▶

Program I

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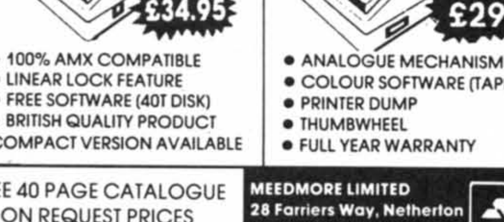

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◀ *From Page 115*

```
  320 DEFPROCDIRECT
  330 PT%=INSTR(L$,"LIST"):IF PT%>0 PROC
LIST:ENDPROC
  340 IF INSTR(L$,"NEW")>0 PROCNEW:ENDPR
OC
  350 IF INSTR(L$,"COMPILE")>0 PROCCOMPI
LE:ENDPROC
  360 IF INSTR(L$,"HELP")>0 PRINT:FORL%=
1TO MAXCOM%:PRINTTAB(6);K$(L%):NEXT:ENDP
ROC
```

Get it right!

```
  10 =    0 0 |  530 = 830B 3 | 1050 = 2FFA 9
  20 =    0 0 |  540 = A7EC C | 1060 = 6929 9
  30 =    0 0 |  550 = 3E04 B | 1070 = 9F59 8
  40 =    0 0 |  560 = DFD9 B | 1080 = B094 4
  50 =    0 0 |  570 = E531 A | 1090 = E929 5
  60 = F14A A |  580 = FD0D E | 1100 = 6173 9
  70 = 725F 9 |  590 = AC66 4 | 1110 = D1FC E
  80 = 2BD6 F |  600 =  2BC 3 | 1120 = BF5C 5
  90 = 8B93 2 |  610 = EEE9 C | 1130 = A01F E
 100 = 2D03 3 |  620 = D014 9 | 1140 = E2FA 9
 110 = 9506 F |  630 = BE17 0 | 1150 = EFDD E
 120 = 78F4 D |  640 = 9E30 F | 1160 = C53A 6
 130 = EEFA 3 |  650 = D987 6 | 1170 = A2A1 0
 140 = 34D9 B |  660 = 51FE 8 | 1180 = E8C2 9
 150 = A32A 3 |  670 = 1D99 6 | 1190 = 79E7 D
 160 = BF57 7 |  680 = D373 B | 1200 = CA78 1
 170 =  BC9 F |  690 = BFC8 E | 1210 = DCC5 5
 180 = 8F76 8 |  700 = 21CC F | 1220 = 9AF2 4
 190 = 5D15 5 |  710 = 3CC2 F | 1230 = DD44 B
 200 = 7FB7 8 |  720 = FF1D D | 1240 = 5FC0 4
 210 = 1B9C A |  730 = 7C6D 5 | 1250 = 26B5 4
 220 = DC42 3 |  740 = A124 E | 1260 = 7FB2 6
 230 =  F6B 7 |  750 = 6343 9 | 1270 = 3311 4
 240 = 692F 5 |  760 = 3DA0 B | 1280 = DA33 B
 250 = 1BDA A |  770 = 9F7C B | 1290 = AD89 9
 260 = FCC1 8 |  780 = E18F 6 | 1300 = 3F11 3
 270 = AE46 4 |  790 = 3B7C 1 | 1310 = 49D0 7
 280 = B509 0 |  800 = 1660 B | 1320 = FFC3 6
 290 = 7C06 8 |  810 = 9218 7 | 1330 = 346A 3
 300 = 5751 C |  820 =  852 7 | 1340 =  372 3
 310 = ED0F 3 |  830 = 636C 5 | 1350 = 4A61 B
 320 = D6BF 0 |  840 = 81E9 C | 1360 = CDC7 2
 330 = A1D1 5 |  850 = 587E 3 | 1370 = 4379 0
 340 = F5B1 0 |  860 = 3617 D | 1380 = 79B3 E
 350 = 706B C |  870 = C79D 9 | 1390 = DC83 A
 360 = 3AE9 1 |  880 = 8B58 4 | 1400 = F146 D
 370 = 165B 4 |  890 = 80DF 2 | 1410 = C79D E
 380 = 9E67 2 |  900 = 90CE 2 | 1420 = 55AF 6
 390 = A0EE A |  910 = 869B 9 | 1430 = 7C7F 7
 400 = 4D86 8 |  920 = 7BB6 2 | 1440 = 9CEA 5
 410 = 68DF C |  930 = E21D 1 | 1450 = 4C86 E
 420 = 722D 5 |  940 = 9990 1 | 1460 = 23DE 1
 430 = 1537 C |  950 = 1D8D 7 | 1470 = 36DD D
 440 = 686F C |  960 = 647E D | 1480 = 66EF 9
 450 = DF19 9 |  970 = 1F34 3 | 1490 = 92D5 9
 460 =  26C 5 |  980 = D201 6 | 1500 = C020 E
 470 = 2B0A 1 |  990 = CDFB 5 | 1510 = DB2C B
 480 = C3DB 7 | 1000 = ED0F D | 1520 = 693D 3
 490 = 59F1 1 | 1010 = D6C3 A | 1530 = F15B E
 500 = ED0F C | 1020 = 4D71 8 | 1540 = 5FA9 E
 510 = 10EC B | 1030 = 7E7E 0 | 1550 = 8A45 0
 520 = BC0A 9 | 1040 = 7841 D | 1560 = 1BCE 6
```

```
  370 IF INSTR(L$,"LOAD")>0 PROCLOAD:END
PROC
  380 IF LEFT$(L$,4)="SAVE" PROCSAVE:END
PROC
  390 IF INSTR(L$,"CSAVE")>0 PROCCSAVE:E
NDPROC
  400 IF LEFT$(L$,1)="*" L$:ENDPROC
  410 IFL$="" ENDPROC ELSE PRINT"Unknown
 command.":ENDPROC
  420 DEFPROCLIST
  430 IF RIGHT$(L$,4)="LIST" PROCLIST1(0
,MAX%):ENDPROC
  440 BASE%=PT%+4:PT%=INSTR(L$,",",BASE%
)
  450 IF PT%=0 PROCLIST1(VALRIGHT$(L$,LE
NL$-BASE%+1),VALRIGHT$(L$,LENL$-BASE%+1)
):ENDPROC
  460 S%=VAL(RIGHT$(L$,LENL$-BASE%+1))
  470 BASE%=PT%+1
  480 E%=VAL(RIGHT$(L$,LENL$-BASE%+1))
  490 IF E%=0 PROCLIST1(S%,MAX%):ENDPROC
 ELSE PROCLIST1(S%,E%)
  500 ENDPROC
  510 DEFPROCLIST1(S%,E%)
  520 IF MAX%=0 ENDPROC
  530 IF S%>MAX% OR S%<0 OR E%<S% OR E%>
MAX% PRINT"Can't LIST that.":ENDPROC
  540 PRINT:FORL%=S% TO E%
  550 L$=L$(L%):IF L$="" THEN 570
  560 PRINTTAB(5-LENSTR$L%);STR$L%;" ";K
$(ASC(LEFT$(L$,1))-64);RIGHT$(L$,LENL$-1
)
  570 NEXT:ENDPROC
  580 DEFPROCNEW:MAX%=0:O%=base%:FORL%=0
TOMAXLIN%:L$(L%)="":NEXT:ENDPROC
  590 DATA CLG,CLS,CSR,COLOUR,DRAW,GCOL,
GWIND,MODE,MOVE,PLOT,PRINT,SQUARE,TAB,TW
IND,VDU,FILL
  600 DATA 0,0,0,0,1,1,3,0,1,2,0,7,1,3,0
,1
  610 DEFPROCLOAD:PROCFL:IF PT%=0 ENDPRO
C
  620 PROCNEW:CH%=(F$):IF CH%=0 PRINT"No
 such file.":ENDPROC
  630 L%=10:REPEAT:INPUT#CH%,L$(L%):L%=L
%+10
  640 UNTIL EOF#CH%:CLOSE#CH%
  650 MAX%=L%:ENDPROC
  660 DEFPROCFL:PT%=INSTR(L$,""""):IF PT
%=0 PRINT"Missing ""."":ENDPROC ELSEF$=R
IGHT$(L$,LENL$-PT%):IF RIGHT$(F$,1)=""""
 F$=LEFT$(F$,LENF$-1):ENDPROC ELSE ENDPR
OC
  670 DEFPROCSAVE:PROCFL:IF PT%=0 ENDPRO
C
  680 CH%=OPENOUT(F$):FORL%=0 TO MAX%
  690 IF L$(L%)<>"" PRINT#CH%,L$(L%)
  700 NEXT:CLOSE#CH%:ENDPROC
  710 DEFPROCCSAVE:PROCFL:IF PT%=0 ENDPR
OC
  720 IF O%=base% PRINT"No compiled code
.":ENDPROC
  730 F$=RIGHT$(L$,LENL$-PT%):IF RIGHT$(
F$,1)="""" F$=LEFT$(F$,LENF$-1)
  740 "SAVE "+F$+" "+STR$~base%+" "+STR$
~O%+" "+STR$~EX%+" "+STR$~EX%:ENDPROC
  750 DEFPROCCOMPILE:IF MAX%=0 PRINT"No
program.":ENDPROC
  760 REPEAT:PRINT"Execution address?"CH
R$131"&";:X%=0:Y%=&C:A%=0:CALL&FFF1:EX$=
"&"+$&B00:UNTILEVAL EX$>0:EX%=EVALEX$
  770 PRINT"Compiling...":fill%=0:FORP
ASS=4TO6STEP2:P%=EX%:O%=base%:IF PASS=4
PRINTTAB(5)CHR$134"1st pass"; ELSE PRINT
TAB(5)CHR$134"2nd pass";
  780 FOR LIN%=0 TO MAX%:PROCcompile
  790 NEXT:[OPT PASS:RTS
  800 .vdu
  810 PLA:STA &70:PLA:STA &71
  820 LDY #1:LDA (&70),Y:TAX
  830 .vduloop
  840 INY:LDA (&70),Y:JSR &FFEE
  850 DEX:BPL vduloop:INY:TYA:CLC
  860 ADC &70:STA &70
  870 LDA &71:ADC #0:STA &71:JMP (&70)
  880 ]
  890 IF fill%=1 PROCFILL
  900 NEXT:L%=O%-base%:PRINT'"Code is "
;L%;" (&";~L%;") bytes long":ENDPROC
  910 DEFPROCGETPARAMS:c%=0
  920 BASE%=2:ptr%=0:REPEAT
  930 T$=RIGHT$(L$,LENL$-BASE%):V%=VALT$
  940 parms%(ptr%)=V% MOD 256:parms%(ptr
%+1)=V% DIV 256:ptr%=ptr%+2
  950 BASE%=BASE%+LENSTR$V%
  960 PT%=INSTR(L$,",",BASE%)
  970 IF PT%>0 BASE%=PT%:c%=c%+1
  980 UNTIL BASE%>LENL$ OR PT%=0
  990 IF K%<>11 AND K%<>15 AND c%<>l%(K%
) PRINT"Bad parameters in line ";LIN%:
GOTO80
 1000 ENDPROC
 1010 [OPT PASS:LDA #16:JSR &FFEE:]:ENDP
ROC
 1020 [OPT PASS:LDA #12:JSR &FFEE:]:ENDP
ROC
 1030 [OPT PASS:JSR vdu:EQUB10:EQUB23:EQ
UB1:EQUBparms%(0):EQUD0:EQUD0:]:ENDPROC
 1040 [OPT PASS:JSR vdu:EQUB1:EQUB17:EQU
Bparms%(0):]:ENDPROC
 1050 [OPT PASS:JSR vdu:EQUB5:EQUB25:EQU
B5:]:FORL%=0TO3:[OPT PASS:EQUBparms%(L%)
:]:NEXT:ENDPROC
 1060 [OPT PASS:JSR vdu:EQUB2:EQUB18:EQU
Bparms%(0):EQUBparms%(2):]:ENDPROC
 1070 [OPT PASS:JSR vdu:EQUB8:EQUB24:]:F
ORL%=0TO7:[OPT PASS:EQUBparms%(L%):]:NEX
T:ENDPROC
 1080 [OPT PASS:JSR vdu:EQUB1:EQUB22:EQU
Bparms%(0):]:ENDPROC
 1090 [OPT PASS:JSR vdu:EQUB5:EQUB25:EQU
B4:]:FORL%=0TO3:[OPT PASS:EQUBparms%(L%)
:]:NEXT:ENDPROC
 1100 [OPT PASS:JSR vdu:EQUB5:EQUB25:]:F
ORL%=0TO4:[OPT PASS:EQUBparms%(L%):]:NEX
T:ENDPROC
 1110 B%=LENL$-1:[OPT PASS:JSR vdu:EQUB
B%:]:FORL%=3 TO LENL$:B$=MID$(L$,L%,1):[
OPT PASS:EQUS B$:]:NEXT:[OPT PASS:EQUB13
:EQUB10:]:ENDPROC
 1120 [OPT PASS:JSR vdu:EQUB23:]:FORX%=0
TO12 STEP4:[OPT PASS:EQUB25:]:IF X%=0 [O
PT PASS:EQUB4:] ELSEIF X%=4 [OPT PASS:EQ
UB5:] ELSE [OPT PASS:EQUB85:]
 1130 FORL%=0TO3:[OPT PASS:EQUBparms%(X%
+L%):]:NEXT:NEXT:ENDPROC
 1140 [OPT PASS:JSR vdu:EQUB2:EQUB31:EQU
Bparms%(0):EQUBparms%(2):]:ENDPROC
 1150 [OPT PASS:JSR vdu:EQUB4:EQUB28:]:F
ORL%=0TO6 STEP2:[OPT PASS:EQUBparms%(L%)
:]:NEXT:ENDPROC
 1160 [OPT PASS:JSR vdu:EQUBc%:]:FORL%=0
TOc%*2 STEP2:[OPT PASS:EQUBparms%(L%):]:
NEXT:ENDPROC
 1170 [OPT PASS:JSR fill:]:FORL%=0TO3:[O
PT PASS:EQUBparms%(L%):]:NEXT:fill%=1:EN
DPROC
 1180 DEFPROCcompile:IF L$(LIN%)="" ENDP
```

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```
ROC
 1190 L$=L$(LIN%):K%=ASC(LEFT$(L$,1))-64
:PROCGETPARAMS:ON K% GOTO1010,1020,1030,
1040,1050,1060,1070,1080,1090,1100,1110,
1120,1140,1150,1160,1170
 1200 CLOSE#0:IF ERR=17 PRINT"Break":GO
TO80
 1210 REPORT:PRINT:GOTO80
 1220 DEFPROCFILL
 1230 [OPT PASS
 1240 .fill
 1250 PLA:STA &70:PLA:STA &71:JSR copy
 1260 JSR point:STA col:JSR line
 1270 .loop1
 1280 CLC:LDA &74:ADC #4:STA &74
 1290 LDA &75:ADC #0:STA &75:JSR point
 1300 CMP col:BNE down:JSR line
 1310 JMP loop1
 1320 .down
 1330 JSR copy
 1340 .loop2
 1350 SEC:LDA &74:SBC #4:STA &74
 1360 LDA &75:SBC #0:STA &75:JSR point
 1370 CMP col:BNE exit:JSR line
 1380 JMP loop2
 1390 .exit
 1400 CLC:LDA &70:ADC #5:STA &70
 1410 LDA &71:ADC #0:STA &71:JMP (&70)
 1420 .copy
 1430 LDX #3:LDY #4
 1440 .copyloop
 1450 LDA (&70),Y:STA &72,X:DEY:DEX
 1460 BPL copyloop:RTS
 1470 .point
 1480 LDA #9:LDX #&72:LDY #0:JSR &FFF1
 1490 LDA &76:RTS
 1500 .line
 1510 LDA #25:JSR &FFEE:LDA #77
 1520 JSR &FFEE:LDX #0:LDY #3
 1530 .lineloop
 1540 LDA &72,X:JSR &FFEE:INX:DEY
 1550 BPL lineloop:RTS
 1560 ]:ENDPROC
```

```
   10 MODE 2
   20 GCOL 0,6
   30 SQUARE 370,920,930,920,370,330,930
,330
   40 GCOL 0,0
   50 SQUARE 400,900,900,900,400,350,900
,350
   60 GCOL 0,2
   70 MOVE 490,600
   80 DRAW 790,600
   90 DRAW 770,730
  100 DRAW 720,810
  110 DRAW 640,850
  120 DRAW 560,810
  130 DRAW 510,730
  140 DRAW 490,600
  150 MOVE 490,580
  160 DRAW 790,580
  170 DRAW 770,530
  180 DRAW 710,480
  190 DRAW 640,470
  200 DRAW 570,480
  210 DRAW 510,530
  220 DRAW 490,580
  230 MOVE 640,470
  240 DRAW 655,440
  250 MOVE 490,475
  260 DRAW 800,405
  270 FILL 640,500
  280 FILL 640,700
  290 COLOUR 129
  300 COLOUR 3
  310 TAB 6,25
  320 PRINT Mini-Com
  330 COLOUR 128
  340 COLOUR 5
  350 TAB 2,28
  360 PRINT Graphics Compiler
```

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ONE skill that is thrust upon you as a parent is that of emergency repair man. When bright eyes hand you a tangled mess of plastic and a voice says, "Daddy mend" you just have to try somehow.

However, when the much-loved Etch-a-sketch went the way of all toys there was not a lot I could do – the insides are coated with a fine metallic powder that definitely would not go well with the decor. So I rashly promised to make another, but this time on the BBC Micro.

Whether it was the simplicity of the project or the constant mithering I don't know, but it was completed in record time. I thought it might make an interesting project for those of you who are beginners at computer interfacing.

The toy has two controls: One that draws horizontally and the other vertically. A potentiometer, or pot for short, provides the two electrical controls we need and to read them we simply connect them up to the analogue input port.

A pot is a potential divider – a resistive element with a tap point in the middle – and as we turn the knob we can move the tap point (or wiper) from one end to the other. If we have a fixed voltage across the pot, the voltage (or potential) at the wiper can be varied from nothing to full.

Now, the analogue to digital converter accepts a voltage between zero and a reference one. Fortunately we can get access to this reference through the 15-way D-type connector.

Therefore if we want to control the readings from the converter over the full range we need to connect the fixed ends of the pot to zero volts (or earth) and the V ref output. Then we need to connect the wiper to the voltage input: This is shown in Figure I.

Connections to the 15-way connector are quite easy as the numbers are marked on the back of the plug – you can see them with the help of any domestic electron microscope! However, in order to help you, the circuit is shown in Figure II as a practical diagram.

The values of the pots are not critical and anything between 5K and 1M could be used. Make sure, however, that they are linear and not log. If you use the latter you will find all the control is at one end of the travel. Note that this is the same principle used for analogue joysticks.

If you haven't got the parts in your junk box they can be obtained as Body Build pack No. 47, using the order form accompanying this article.

Well, that's the construction of the hardware over in double quick time, so now we have to look at what is needed for the software. This turns out to be equally simple as you can see if you look at Program I.

In fact it could have been even simpler without the subtle improvements such as line 40, which ensures that only two analogue input channels are working to speed up the response of the circuit and

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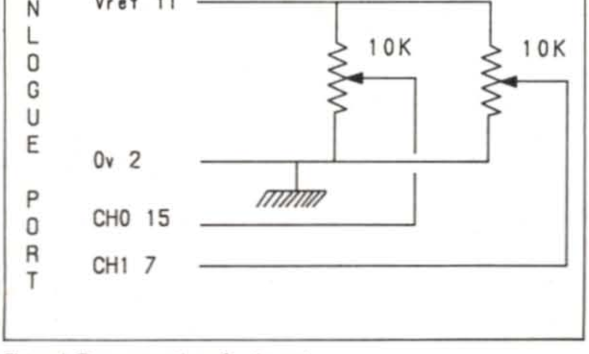

Figure I: The connections for the pot

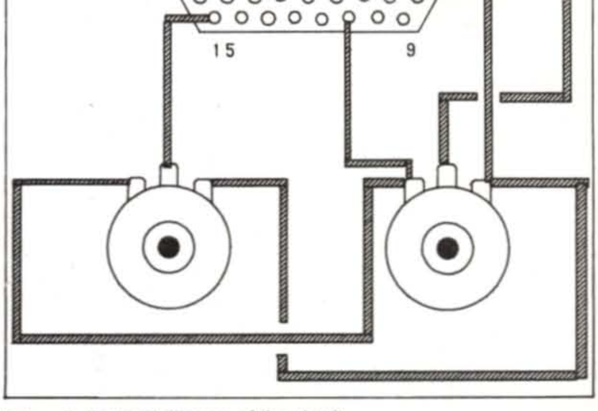

Figure II: Practical diagram of the circuit

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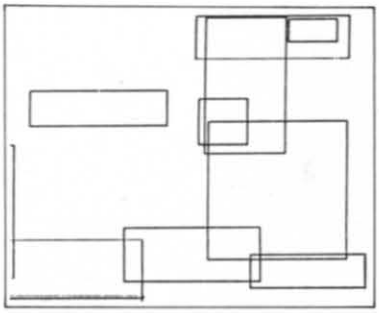
line 50 that turns the cursor off.

The program will work in any mode, but mode 0 gives the best resolution. The main loop simply reads the two input channels and scales them to get rid of the meaningless bits on the end of the conversion figure. Then the values read are used to draw a line from the previous point.



Line 100 is a simple delay and ensures that next time round the loop both input channels will have completed a conversion.

Finally, line 110 looks to see if the spacebar is being pressed: If it is, the screen is wiped clean. Couldn't be simpler could it? If the line drawn is jagged you probably have a dirty pot so simply squirt the track with some switch cleaner.

But with more software we could do even more. Program II shows a draughting package based on the same hardware. This allows you to draw diagonal lines, triangles, rectangles and even circles using the controls. Lines are rubber banded so they may be positioned anywhere on screen, the colour can be changed, and your creations may even be saved on disc.

When typing it in, line 80 should be omitted until you have entered the complete program correctly as this restricts the text display to a single line at the top of the screen – any error message will scroll off before you can read it.

The program is quite simple to operate: Select a mode such as line and you will see a dot you can move with the controls. When it is in the correct position hit a key and that will fix one end.

Now you can rubber-band it until it is in the correct position and you then have a choice: Pressing the spacebar will fix the line and allow you to move and draw another, or pressing Return will draw the line and allow you to enter another shape mode. Finally, pressing J will join the end of that line to another.

Note that when you select a polygon you are asked for the number of sides and if you choose a large number (like 20) the result will be almost as good as a circle.

And there you have it – a neat micro-based Etch-a-sketch. It's quite surprising what you can do with a simple piece of hardware, isn't it?

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Program I

```
 10 REM Sketch
 20 REM By Mike Cook
 30 MODE 0
 40 *FX16,2
 50 VDU 23;8202;0;0;0;0:
 60 REPEAT
 70 X%=ADVAL(1) DIV 64
 80 Y%=ADVAL(2) DIV 64
 90 DRAW X%,Y%
100 *FX19
110 IF INKEY(-99) THEN CLS
120 UNTIL FALSE
```

Get it right!

```
10 =      0 0 | 50 = FF7A D |  90 = 51DC 1
20 =      0 0 | 60 = BFBA 4 | 100 = 61AE D
30 = 6075 5   | 70 = 4406 A | 110 =  69B 0
40 = 1594 3   | 80 = 9FF1 F | 120 = 226C 1
```

Program II

```
 10 REM DRAUGHTSMAN - Mike Cook
 20 DIM CLI% 27
 30 M%=1:C%=3:MODE M%
 40 *FX16,2
 50 TRIANGLE=FALSE:CLS
 60 BLUE_IN_THE_FACE=FALSE
 70 PROC_INSTRUCTIONS
 80 VDU 28,0,0,39,0
 90 VDU 19,2,2,0,0,0
100 GCOL 3,C%:X%=-1:Y%=-1
110 REPEAT
120 A$=GET$
130 IF A$="W" THEN CLG
140 IF A$="S" THEN PROC_FILE
150 IF A$="G" THEN PROC_GET
160 IF A$="P" THEN PROC_POLY
170 IF A$="R" THEN PROC_REC
180 IF A$="C" THEN PROC_COLCHANGE
190 IF A$="L" THEN PRINT"LINE";:PROC_L
INE
200 IF A$="T" THEN PROC_TRIANGLE
210 IF A$<>"C" THEN PRINT
220 UNTIL BLUE_IN_THE_FACE
230 DEF PROC_FILE
240 PRINT
250 INPUT"FILE NAME FOR SAVED SCREEN",
F$
260 IF LEN(F$) < 1 THEN ENDPROC
270 $CLI%="SAVE P."+F$+" 3000 8000"
280 X%=CLI% MOD 256:Y%=CLI% DIV 256
290 CALL &FFF7
300 X%=-1:Y%=-1
310 ENDPROC
320 DEF PROC_GET
330 PRINT
340 INPUT"FILE NAME OF SCREEN",F$
350 IF LEN(F$) < 1 THEN ENDPROC
360 $CLI%="LOAD P."+F$
370 X%= CLI% MOD 256:Y%=CLI% DIV 256
380 CALL &FFF7
390 X%=-1:Y%=-1
400 ENDPROC
410 DEF PROC_COLCHANGE
420 C%=(C%+1) AND 3
430 IF C%=0 THEN C%=C%+1
440 COLOUR C%:GCOL 3,C%
450 PRINT"NEW COLOUR ";
460 ENDPROC
470 DEF PROC_BAND1
480 REPEAT
490 PROC_FOLLOW:A$=INKEY$(0)
500 UNTIL A$<>""
510 OX%=X%:OY%=Y%:XT%=X%:YT%=Y%
520 ENDPROC
530 DEF PROC_BAND2
```

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```
540 REPEAT
550 PROC_FOLLOW
560 MOVE OX%,OY%:PLOT 13,XT%,YT%
570 MOVE OX%,OY%:PLOT 13,X%,Y%
580 XT%=X%:YT%=Y%:A$=INKEY$(0)
590 UNTIL A$<>""
600 MOVE OX%,OY%:PLOT 13,X%,Y%
610 ENDPROC
620 DEF PROC_LINE
630 REPEAT
640 IF A$<>"J" THEN PROC_BAND1
650 PROC_BAND2
660 GCOL 0,C%:MOVE OX%,OY%:DRAW X%,Y%
670 GCOL 3,C%
680 T1X%=OX%:T1Y%=OY%:OX%=X%:OY%=Y%
690 UNTIL A$=CHR$(13) OR TRIANGLE=TRUE
700 ENDPROC
710 DEF PROC_TRIANGLE
720 PRINT"TRIANGLE";
730 REPEAT
740 TRIANGLE=TRUE:PROC_LINE
750 TRIANGLE=FALSE
760 REPEAT
770 T2X%=X%:T2Y%=Y%
780 PROC_TRIBAND(X%,Y%)
790 REPEAT
800 PROC_FOLLOW:PROC_TRIBAND(OX%,OY%)
810 OX%=X%:OY%=Y%
820 PROC_TRIBAND(X%,Y%):A$=INKEY$(0)
830 UNTIL A$<>""
840 PROC_TRIBAND(X%,Y%):GCOL 0,C%
850 PROC_TRIBAND(X%,Y%):GCOL 3,C%
860 IF A$<>CHR$(13) THEN PLOT 69,X%,Y%
870 T1X%=T2X%:T1Y%=T2Y%
880 UNTIL A$<>"J"
```

This is one of hundreds of programs available FREE for downloading on

MicroLink

In addition to these many BBC Micro programs in the MicroLink library will also run on the Electron.

```
890 UNTIL A$=CHR$(13)
900 ENDPROC
910 DEF PROC_TRIBAND(X%,Y%)
920 MOVE T1X%,T1Y%:PLOT 13,X%,Y%
930 PLOT 13,X%,Y%
940 MOVE T2X%,T2Y%:PLOT 13,X%,Y%
950 ENDPROC
960 DEF PROC_REC
970 PRINT"RECTANGLE";
980 REPEAT
990 PROC_BAND1
1000 REPEAT
1010 PROC_RECBAND
1020 REPEAT
1030 PROC_FOLLOW:PROC_RECBAND
1040 OX%=X%:OY%=Y%
1050 PROC_RECBAND:A$=INKEY$(0)
1060 UNTIL A$<>""
1070 PROC_RECBAND:GCOL 0,C%
1080 PROC_RECBAND:GCOL 3,C%
1090 IF A$<> CHR$(13) THEN PLOT69,X%,Y%
1100 XT%=X%:YT%=Y%
1110 UNTIL A$<>"J"
1120 UNTIL A$=CHR$(13)
1130 ENDPROC
1140 DEF PROC_RECBAND
1150 MOVE XT%,YT%
1160 PLOT 13,XT%,OY%:PLOT 13,OX%,OY%
1170 PLOT 13,OX%,YT%:PLOT 13,XT%,YT%
1180 ENDPROC
1190 DEF PROC_POLY
1200 INPUT"POLYGON NUMBER OF SIDES",N%
1210 PRINT N%;" SIDED POLYGON";
1220 REPEAT
1230 PROC_BAND1
1240 REPEAT
1250 PROC_BAND2
1260 PROC_DPOLY(X%,Y%,OX%,OY%,N%)
1270 IF A$="J" THEN MOVE OX%,OY%:PLOT 1
3,X%,Y%
1280 UNTIL A$<>"J"
1290 UNTIL A$=CHR$(13)
1300 ENDPROC
1310 DEF PROC_DPOLY(X,Y,XT%,YT%,N%)
1320 LOCAL C1,S1,P,R,A%,X1,Y1
1330 GCOL 0,C%:P=2*PI/N%
1340 N%=N%+1:C1=COS(P)
1350 S1=SIN(P):MOVE X,Y
1360 FOR A%=1 TO N%-1
1370 X1=XT%+(X-XT%)*C1-(Y-YT%)*S1
1380 Y1=YT%+(X-XT%)*S1+(Y-YT%)*C1
1390 X=X1:Y=Y1:DRAW X,Y
1400 NEXT
1410 GCOL 3,C%:PLOT 69,X%,Y%
1420 ENDPROC
1430 DEF PROC_FOLLOW
1440 XT=ADVAL(1)/51
1450 YT=ADVAL(2) DIV 64
1460 PLOT 69,X%,Y%:X%=XT:Y%=YT
1470 PLOT 69,X%,Y%
1480 ENDPROC
1490 DEF PROC_INSTRUCTIONS
1500 PRINT
1510 PRINT SPC(9);"Etch a Sketch Draugh
tsman"
1520 PRINT SPC(13);"By Mike Cook":PRINT
1530 PRINT"First select a mode by typin
g a letter:-"
1540 PRINT:PRINT"L - Draw a LINE"
1550 PRINT"T - Draw a TRIANGLE"
1560 PRINT"R - Draw a RECTANGLE"
1570 PRINT"P - Draw a POLYGON or CIRCLE
"

1580 PRINT
1590 PRINT"Then move the dot with the t
wo controls."
1600 PRINT
1610 PRINT"Press RETURN at the end of e
ach stage"
1620 PRINT"or to stay in the mode press
 SPACE."
1630 PRINT"Alternatively pressing J as
the last key";
1640 PRINT"will Join up the next shape.
"

1650 PRINT:PRINT
1660 PRINT"Other commands are:-":PRINT
1670 PRINT"C - To change the COLOUR"
1680 PRINT"W - To Wipe the screen clean
"

1690 PRINT"S - To SAVE the screen as a
file"
1700 PRINT"G - To GET a screen previous
ly saved"
1710 PRINT:PRINT"Press any key to begin
."
1720 A$=GET$:CLS
1730 ENDPROC
```

Get it right!

This listing is included in this month's tape & disc offer. See order form on Page 151.

```
  10 =    0 0 |  300 = 603D A |  590 =  2C6 D |  880 = 60E1 8 | 1170 = 9F11 F | 1460 =  FFF 9
  20 = 4E8D D |  310 = ED0F 9 |  600 = FCCB A |  890 = C15F F | 1180 = ED0F 7 | 1470 = B9A7 0
  30 = 339F 8 |  320 = 3419 1 |  610 = ED0F 3 |  900 = ED0F A | 1190 = A39A 0 | 1480 = ED0F 5
  40 = 1594 7 |  330 = FF3E 0 |  620 = F070 6 |  910 = D916 D | 1200 = C542 7 | 1490 = 4D94 2
  50 = 2B3F E |  340 = EB27 5 |  630 = BFBA 4 |  920 = F2AA 2 | 1210 = 1B66 4 | 1500 = FF3E 6
  60 = 5008 C |  350 = 9032 5 |  640 = F5E1 7 |  930 = 8DF1 8 | 1220 = BFBA 7 | 1510 = AE7B B
  70 = 4EA0 3 |  360 = 998F 0 |  650 = 669A 3 |  940 =  D09 5 | 1230 = 56F9 7 | 1520 = C8BB 8
  80 = 88A9 4 |  370 = 9DE8 2 |  660 =  A4C 6 |  950 = ED0F 9 | 1240 = BFBA F | 1530 = 9E74 1
  90 = CDAD 2 |  380 = 17A4 5 |  670 = 66A7 9 |  960 = FE5C 3 | 1250 = 669A F | 1540 = DFB3 3
 100 = 963C 9 |  390 = 603D 6 |  680 = 2A4A 0 |  970 = 87ED C | 1260 = 9E09 A | 1550 = F632 8
 110 = BFBA 6 |  400 = ED0F A |  690 = 36ED 5 |  980 = BFBA C | 1270 = D0C9 8 | 1560 = 5489 C
 120 = 77F2 D |  410 =  945 9 |  700 = ED0F 4 |  990 = 56F9 7 | 1280 = 60E1 9 | 1570 =  4D3 9
 130 = 62D7 A |  420 = F041 7 |  710 = 5D03 6 | 1000 = BFBA F | 1290 = C15F 0 | 1580 = FF3E D
 140 = 274E B |  430 = 3DEE 1 |  720 = C040 6 | 1010 = 139D 7 | 1300 = ED0F 2 | 1590 = 99B5 F
 150 = 1B11 2 |  440 = 5C6E 9 |  730 = BFBA E | 1020 = BFBA B | 1310 = 4842 8 | 1600 = FF3E F
 160 =  297 6 |  450 = D67B E |  740 = 2995 E | 1030 = F477 E | 1320 =   3A 3 | 1610 = 6890 C
 170 = 87B2 D |  460 = ED0F 0 |  750 = F611 3 | 1040 =  E61 F | 1330 = 6B3D 5 | 1620 = 2117 8
 180 = 7BB1 7 |  470 = C037 0 |  760 = BFBA 7 | 1050 = 95DF F | 1340 = 5A0B B | 1630 = 24B6 E
 190 = 5A6B C |  480 = BFBA 3 |  770 = F4A8 C | 1060 =  2C6 9 | 1350 = D7DE 7 | 1640 = C41C 1
 200 = 1822 D |  490 = D2B4 A |  780 = FA92 9 | 1070 = 38A6 A | 1360 = C856 9 | 1650 = C102 A
 210 = 91B4 2 |  500 =  2C6 4 |  790 = BFBA 6 | 1080 = A37A A | 1370 = 3490 E | 1660 = 2CB1 9
 220 = 15FE A |  510 = E6F8 D |  800 =  F55 9 | 1090 =  6F1 C | 1380 = B183 C | 1670 = 6672 D
 230 = FEB9 1 |  520 = ED0F 3 |  810 =  E61 3 | 1100 = 72BE 2 | 1390 = 3C41 1 | 1680 = DBC9 7
 240 = FF3E 4 |  530 = F054 5 |  820 = 3606 5 | 1110 = 60E1 B | 1400 = 2C83 9 | 1690 = 8D67 4
 250 =   DF 1 |  540 = BFBA D |  830 =  2C6 0 | 1120 = C15F 1 | 1410 = 9A45 3 | 1700 = 381D F
 260 = 9032 6 |  550 = 4FB7 0 |  840 = CE8A 9 | 1130 = ED0F A | 1420 = ED0F 7 | 1710 =  198 A
 270 = 1927 2 |  560 = 732E 8 |  850 = 5556 3 | 1140 = 9952 0 | 1430 = 62C8 6 | 1720 = CEDB D
 280 = 5DFE F |  570 = FCCB 6 |  860 = AED7 6 | 1150 = A39C C | 1440 = 3D39 5 | 1730 = ED0F 0
 290 = 17A4 D |  580 = E9C0 9 |  870 = 95CA 4 | 1160 = F783 0 | 1450 = FC2A 9 |
```

NEW SERIES

B B+

It's a challenge!

Mike Cook throws down the gauntlet to all our programming readers

IF you've just learned to program and don't know what to do next, keep reading. This is the first of a series of articles in which we challenge you to exercise your new-found skill in Basic programming.

It starts on this page with The Challange itself. You can take up the challenge at various different levels of skill, depending how good you are.

We present you with a problem to solve using your BBC Micro. It contains all the information you need to write the program, and if you are a reasonably competent programmer you'll need no further help.

However, if you are just beginning you might not be able to sort all of it out. But just thinking about the problem and trying out a few ideas will help you develop your programming skills.

What you're going to need follows next month: Hints.

In this I'll set out an algorithm you can use to code the problem. This is simply the method you are going to use to implement the solution. It should be relatively straightforward to convert it into a Basic program providing you are familiar with the language.

Then, in the May issue, we'll present The Solution. I will give you a simple no-frills program that will do the job, along with suggestions for further improvement. You can check this against your own answer and perhaps sort out any points you had difficulty with.

Remember, as far as a program is concerned, there are as many right answers as there are wrong ones, but the solutions I favour are simple and readable.

I will avoid, as much as possible, using fancy tricks or so-called clever programming techniques, as most of the time they are not necessary.

So on to Challenge I which is set in a casino . . .

YOU are down on your luck, standing looking at the roulette wheel, when a shady character tugs at your sleeve. After exchanging a few pleasantries he persuades you to slip outside where he will tell you something to your advantage.

So after cashing your remaining chips you follow him out to the alley behind the casino. He whispers in your ear: "For just a pony, Guv, I can tell you my foolproof plan to win".

Maybe it's the drink that softens your heart, or maybe it's the six-inch stiletto knife you feel poking through his coat into yours, but you decide to give him his money and listen to his advice.

"It's all very simple", he says, pushing the money into his overcoat pocket without even bothering to count it. "Just bet on the red".

Feeling cheated, you ask what happens if you lose. "Even simpler", he replies, "bet on the red again, but this time double your stake. If you lose again, double again, eventually you will win because red is an even money chance".

He continues: "When you count your winnings you will find that you are up by your original stake. Drop your bet down again and do it all over again. You can't lose".

With that he slips into the night and you wander home to think about what he has said. Any bet on the red, or the black for that matter, pays even money – what you bet plus your stake back.

So if you bet a pound and lose, then bet two pounds and win, you get four pounds but have only paid out three – one for the first bet and two for the second. As the roulette wheel comprises black and red numbers in equal amounts, a red is bound to come up sooner or later. It's true, you can't lose!

However, you then remember the green – number zero. It's only one place on the wheel, but when that comes up the house wins all bets. That nudges the odds of the red coming up slightly away from even, but that is only one chance in 37.

Yes, it sounds like a really good scheme, so you go to bed dreaming of what you will spend your money on.

In the morning, once your head has cleared, you begin to think and wonder why, if it is that easy, had that man not done it and made himself a fortune?

Glancing over to your trusty BBC Micro you decide to try it out first with pretend money by writing a program to simulate a roulette wheel and test this strategy.

You want to try this not once but many times to ensure it is no fluke. You need to know how many bets it will take to recover your initial outlay of £25 to the man.

What is the best size of bet? The larger the bet the faster you will make money but, also, the more money you will need when doubling. How much stake money will you have to have in reserve? Is it practical?

● *So it's over to you. Can you write the necessary program? If you have problems, next month's hints will help.*

TECHNOMATIC

BBC COMPUTERS & ECONET CENTRE
17 Burnley Road, London NW10 1ED Tel: 01-208 1177
305 Edgware Road, London W2 Tel: 01-723 0233

ARCHIMEDES

300 & 400 SERIES

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Archimedes 310 Basic	£775(a)
Archimedes 310M Basic	£835(a)
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Archimedes 440 Basic	£2,299(a)
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****Monitor prices applicable only when purchased with the micro.***

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(7 skts for ROMs (16K/128K) or RAMS (8K/128K) Battery backup optional.

More podules are expected in the coming weeks please telephone for latest updates

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Full implementation of IEEE std 488 1978 & supp. IEEE std 488A 1980. Full specification on request.

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FREE £115 inc vat VOUCHER

with every Archimedes model 310, 410 and 440 purchased from us. This voucher can be redeemed against any future purchase made from us. Additionally we will offer discounts upto 10% on Archimedes software and upto 5% on Archimedes hardware stocked by us to all purchasers of Archimedes computers. This is a limited period offer so do not miss your opportunity for a bargain not to be repeated.

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Please check on availability of some of the above packages

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Acorn's new file server system

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Full details on request

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Ecolink allows you to connect a PC/XT or AT to an econet network. Supplied complete with comprehensive manual, software and cable.

Full spec on request **£299(b)**

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Incl free educational/fun software pack made up from BBC Publications' range (normal RRP £40)

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MASTER COMPACT

All Master Compact computers come complete with 128K RAM and an integral 640K 3.5″ drive with educational software. We also include our own free bundled educational/fun pack made up from BBC Publications' range with each Compact.

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Plotmate A4S Plotter	£250(a)

The products listed above are brand new but carry no warranty

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ATPL Board for Model B. Simple to instal, no soldering. Allows expansion to 15 Roms + 2*8K RAMS	£37(c)
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TECHNOMATIC

17 Burnley Road, London NW10 1ED Tel: 01-208 1177

TECHNOMATIC DISC DRIVES

TECHNOMATIC

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PD 800P

A range of high quality high performance drives to meet the needs of all BBC Micro Users.

All drives fitted with high quality, slim line Mitsubishi drive mechanism and necessary cables.

*All drives are fitted with high quality slim line ultra low power mechanisms capable of single and double density operation and offering fast track access and head setting times. Our confidence in their quality enables us to offer a **two year parts and labour warranty** on these mechanisms without any extra charge.

*5.25" floppy drives are fitted with 40/80 track switches as standard at no extra cost. The switches are located in the front and clearly marked to indicate the status at a glance.

*The mechanisms are set inside attractively styled, sturdy metal casings painted in BBC beige colour.

*All drives fitted with all necessary leads and are ready for operation on unpacking. The drives with the mains power supply are supplied with a mains lead fitted with a suitably fused 13A moulded plug.

*TECHNOMATIC drives stand out from other drives because of the high quality of construction and use of reliable switchmode power supply units on dual drives.

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TDM2 Two computers/one drive unit	**£65(b)**
TDM4 Four computers/one drive unit	**£115(b)**

TECHNOMATIC WINCHESTERS

Technomatic offer the most popular range of Winchester drives for BBC micro systems at competitive prices. The drives are fully compatible with Acorn ADFS system. Fan cooled switch mode power supply ensure efficient and reliable operation. Combination of floppy and winchester drives in our elegant plinth housing provides an ideal solution for need to have large storage and ease of transferring data to floppies.

Technomatic front end utility for the Master supplied with the winchesters at no extra cost provides an easy and efficient file management system. The entire contents of the drive are displayed on the screen on boot up, each file or directory appearing as an icon. The icon type indicates whether directory or file and type of data if latter.

Larger capacity drives available on request.

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P40HD TECHNOMATIC 40 Mbyte Winchester Drive with Acorn ADFS ROM	**£749(a)**
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P2041HT As P204HP but also with a 10 Mbyte tape streamer backup unit and backup utilities. Includes ADFS Rom.	**£1179(a)**
TS10 10 Mbyte Tape Streamer Backup unit with utilities.	**£599(a)**
TFC10 10 Mbyte Pre-formatted Cartridge for use with P2041HT and TS10.	**£19(d)**

Technomatic Winchesters can be adapted to operate with the SJ Research FileServer by internal modification. However this must be specified at the time of ordering otherwise the drive has to be returned to us for modification.

Adaptor for SJ FileServer	**£28**

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These units let you share a Winchester drive between a number of computers. Full details on request.

TWM2 for two computers.	**£99 (b)**
TWM4 for four Computers.	**£149 (b)**

NEW

Following the great success enjoyed by our P20HD unit, we are pleased to announce the launch of P30HD – a 30Mbyte hard drive. This drive is also supplied with the free front end utility for the Master. £449(a)

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diskettes
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diskettes

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EPSON EX1000	**£539(a)**
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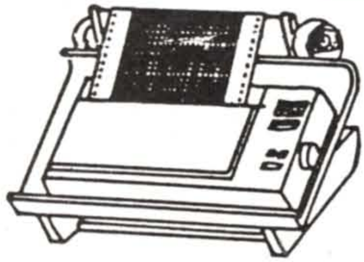
NATIONAL PANASONIC KXP1081	**£149(a)**
STAR NL10 (Parallel Interface)	**£179(a)**
STAR NL10 (Serial Interface)	**£219(a)**
INTEGREX Multicolour Inkjet printer	**£549(a)**
BROTHER HR20	**£349(a)**
NAT PANASONIC KX P3131 includes massive buffer of 38K	**£249(a)**
JUKI 6100 Daisy wheel printer	**£295(a)**
BBC/Master Parallel Printer Lead (1.2m)	**£5(d)**
BBC/Master Parallel Printer Lead (2m)	**£7(d)**
Compact Parallel Printer Lead (1.2m)	**£9(d)**
Archimedes Parallel Printer Lead (2m)	**£9(d)**

PRINTER STAND

A new style printer stand with easy paper feed and paper seperation, provides complete access to paper. Can be used with both top and bottom paper feed. Very space efficient. **£26 (b)**



MODEMS

All modems listed below will be supplied with a BBC data lead.

MIRACLE WS4000 V21/23	**£135(b)**
MIRACLE WS3000 V21/23	**£244(b)**
MIRACLE WS3000 V22	**£409(b)**
MIRACLE WS3000 V22 bis	**£537(b)**
(All modems are BABT approved)	
BBC Data Cable for WS3000/4000	**£7(d)**
MIRACLE WS2000V21/23 & BELL stds	**£92(c)**
WS2000 Auto Dial Card	**£27(d)**
WS2000 Auto Answer Card	**£27(d)**
S2000 SKI Kit	**£5(d)**
WS2000 User Port Lead	**£5(d)**

TIME WARP

Real Time Clock, Plugs into the user port, battery back up as standard, includes manual, demo software including a diary/planner application program **£29(d)**

PLOTTERS

Hitachi 672XD A3 4 Colour HPGL (variety of pens available)	**£465(a)**
Plotmate A4S	**£282(a)**
Plotmate A3M	**£431(a)**

Large Plotters available. Please enquire.

PRINTER SHARERS & BUFFERS

TSB256 Printer Sharer Buffer

Provides a massive buffer size of 256K and connects three computers to one printer. Autoswitching between computers. Facility to print copies. **£189(b)**

BUFFALO PB Buffer

Parallel buffer for internal fitting to most Epson printers. Simple to instal.

PB128 (128K) **£89(c)**

PERIPHERAL & COMPUTER SHARERS

High quality switches to allow the user to switch between computers, printers, modems etc. Fully shielded metal cases, all lines fully switched.

	Parallel		Serial
2 Computers to 1 Printer 36v36-2	£25(c)	25v25-2	£25(c)
3 Computers to 1 Printer 36v36-3	£39(c)	25v25-3	£39(c)
4 Computers to 1 Printer 36v36-4	£45(c)	25v25-4	£45(c)
2 Computers 2 Printers		25v25-x	£49(c)
X-over 36v37-x	£49(c)		
BBC Cable Set 3 to 1 (1m ea)	£24(c)		
BBC Cable Set 4 to 1 (1m ea)	£30(c)		

BBC Computer Sharer: TCS26

1 computer to 2 printers fitted with BBC cable **£21(c)**

Paper & Labels

Plain fanfold paper with microperforation:

2000 sheets 9½ × 11″	**£12 (£3.50)**
2000 sheets 14½ × 11″	**£18.50 (£4.50)**
1500 sheets A4 90gsm	**£18.00 (£4.00)**

Labels/1000

Single Row 3½ × 1⁷⁄₁₆	**£5(d)**
Triple Row 2⁷⁄₁₆ × 1⁷⁄₁₆	**£5(d)**

PROGRAMMING ACCESSORIES/SOFTWARE

Compatible with B, B+ and Master

EpromRyter (Epromer II) EpromRyter is compatible with BBC Master only. See page 7.	**£89(b)**
Upgrade of Epromer II to Eprom Ryter (Please return your Epromer II)	**£49(b)**
EPROMER II	**£89(b)**
MPROMER	**£49(c)**
META ASSEMBLER	**£145(b)**
PORTAL EPROM EMULATOR 512K	**£245(b)**
TEAM Disassembler	**£145(b)**
EPROM ERASERS	
UV1B 6 eproms, safety cutout	**£47(b)**
UV1T 6 eproms, timer, safety cutout	**£59(b)**

MONITORS

14″ MONITORS

Microvitec 1431 Std Res	**£179(a)**
Microvitec 1431AP Std Res + PAL/Aud	**£199(a)**
Microvitec 1451 Med Res	**£225(a)**
Microvitec 1451AP Med Res + PAL/Aud	**£255(a)**
Microvitec 1441 Hi Res	**£359(a)**
Philips 14″ RGB Med Res, high contrast screen, TTL/Linear Input, Mono/Colour Switch Sound Input. Separate controls for brilliance and contrast. This is the monitor used by Acorn with Archimedes and Compact Computers.	**£195(a)**

Microvitec 20″ RGB/PAL/Audio Monitors

Microvitec 2030CS Standard Resolution RGB/Comp Video	**£380(a)**
Microvitec 2040CS High Resolution RGB/Comp Video	**£675(a)**
TAXAN SUPER VISION 620 12″ Hi Res/Hi Contrast Option to switch to green/amber BBC/IBM Compatible	**£269(a)**
TAXAN SUPER VISION 625 12″ Super Hi Res and contrast RGB Monitor with option to switch to mono BBC/IBM compatible.	**£319(a)**

12″ MONOCHROME MONITORS

PHILIPS BM 7502 Hi Res green screen	**£69(a)**
PHILIPS BM7522 Hi Res amber screen	**£75(a)**
PHILIPS BM 7542 Hi Res Paper White screen	**£79(a)**

SPECIAL
for this month
Swivel Stand for Philips Mono monitors £6(c)
(if purchased with monitor)

MONITOR ACCESSORIES

Microvitec Swivel Base (14″ plastic monitors)	**£17(c)**
Monitor Stand Models B & B+	**£10(c)**
Monitor Stand Master	**£13(c)**
Double Tier Stand Models B, B+ or Master	**£24(b)**
Taxan RGB Lead	**£5(d)**
Microvitec Lead	**£3.50(d)**
Monochrome BNC/Phono Lead	**£3.50(d)**

TECHNOMATIC
17 Burnley Road, London NW10 1ED Tel: 01-208 1177

CAD/DRAWING PACKAGES

NOVACAD
Cad Package for B, B & MASTER.
(See page 5 for specification)

Tracker Ball/Mouse Version (TM)	£49 (d)
TM Version plus Tracker Ball	£94 (d)
TM Version plus Mouse	£79 (d)
Plotter Driver Generator	£15 (d)

MOUSE

AMX MOUSE with SUPER ART (pse specify B, B+ or Master)	£59 (d)
STOP PRESS (Pagemaker)	£32 (d)
EXTRA/EXTRA (utility for the Pagemaker)	£19 (d)
MAX	£17 (d)
STAND ALONE MOUSE (includes horizontal scroll lock)	£34 (c)

RB2 TRACKER BALL

RB2 Tracker Ball with Icon Master (for B, B+ & Master)	£59 (c)
RB2 Tracker Ball with Cursor Control Rom (for Master only)	£59 (c)
RB2 Tracker Ball 'Stand Alone' for use with NOVACAD & other software)	£47 (c)
Cursor Control Rom for Master	£12.50 (d)
MIRRORSOFT FLEET STREET EDITOR	£35 (d)

CP/M SOFTWARE

Please send for details on our range of CP/M software for Acorn/Torch Z80 2nd Processors

BBC SOFT/FIRMWARE

DATABASE MANAGEMENT SYSTEMS

VIEWSTORE	£37 (d)
STARdataBASE	£39 (d)
MASTERFILE II	£17 (d)
ACORN OVERVIEW PACKAGE Special Offer (RRP £86)	£69 (b)

WORD PROCESSORS

ACORN VIEW PROFESSIONAL (BBC)	£75 (c)
VIEW 2.1	£35 (d)
VIEW 3.0	£48 (c)
VIEW INDEX	£12 (d)
VIEW PRINTER DRIVER GENERATOR	£7 (d)
VIEWSPELL	£29 (d)
DOT PRINT PLUS	£28 (d)
WORDWISE	£24 (d)
WORDWISE PLUS	£38 (d)
WYSIWYG PLUS	£21 (d)
SPELLMASTER	£47 (d)
INTERWORD	£39 (d)
WORDEASE	£24 (d)
SPELLCHECK III	£31 (d)
EDWORD II	£43 (c)

SPREADSHEETS

VIEWSHEET	£37 (d)
WINDOWMATIC	£15 (d)
VIEWPLOT	£22 (d)
INTERSHEET	£37 (d)
INTERCHART	£26 (d)
ULTRACALC	£26 (d)

MINI OFFICE II DISC Version

For B & B+ 40T or 80T	£14.75 (d)
For Master 80T	£17.30 (d)
For Compact	£19 (d)

MINI OFFICE II ROM Version

For Master, Compact, B+ & B	£48 (c)
MEGA 3Rom	£82(b)

CC's integrated package offering Interword, Intersheet & Interchart on one 128K ROM. For Master, Compact, B+ & B

LANGUAGES

META ASSEMBLER	£145 (b)
TEAM DISASSEMBLER	£145 (b)
MACROM	£33 (d)
ACORN MICRO PROLOG	£62 (d)
ISO-PASCAL	£51 (c)
ISO-PASCAL STAND ALONE GENERATOR	£30 (d)
OXFORD PASCAL (40 or 80T) Specify B or B+	£36 (d)
OXFORD PASCAL for Master	£52 (d)
ACORN LOGO	£46 (c)
LOGOTRON LOGO	£55 (c)
BBC PUBLICATIONS OPEN LOGO	£59 (c)
ACORN LISP ROM	£39 (d)
ACORN FORTH ROM	£39 (d)
ACORN COMAL ROM	£39 (d)
MICROTEXT	£52 (c)
MICROTEXT PLUS	£229 (b)

COMMUNICATIONS

TERMULATOR	£25 (d)
COMMSTAR II	£28 (d)
MAYA Comms Package See next page for details NEW	£49
MODEM MASTER	£11 (d)
COMMAND	£34 (d)
MASTER TERMULATOR	£34.75 (d)

UTILITIES

ACORN BASIC EDITOR	£24 (d)
MONITOR (BBC Pub)	£19 (d)
SLEUTH	£23 (d)
TOOLKIT PLUS	£31 (d)
TOOLBOX 2 (BBC Pub) Manual Cassette	£9.50 (d) £9 (d)
ACORN GXR GRAPHICS ROM specify B or B+	£24(d)
PRINTMASTER	£24 (d)
PRINTWISE	£24 (d)
DUMPMASTER	£26 (d)
FONTWISE PLUS	£17 (d)
ADV TELETEXT UTILITIES ROM	£7.95 (d)

COMPACT (all on 3½" disc)

ARTROOM	£27 (d)
FONTWISE+	£22 (d)
FONT EDITOR	£22 (d)
BETABASE	£27 (d)

WHITE KNIGHT MKII	£16 (d)
BBC PUBLICATIONS BUNDLED SOFTWARE	£18.50 (d)

BBC PUBLICATIONS EDUCATIONAL SOFTWARE

A series of programs developed in many cases alongside Radio & TV programmes by BBC's Education Department which supplement the classroom studies by moving and colourful displays helping in clear understanding of a variety of subjects. Some packages also include audio cassettes.

PRIMARY EDUCATION

ASTRONOMY	£11 (d)
COMPUTERS AT WORK	Aud/EC/disc£16 (c)
PICTURE CRAFT	Disc£17 (d)
INTRODUCING GEOGRAPHY	Disc£16 (d)
MATHS WITH A STORY 1	Cass£8 (d)
MATHS WITH A STORY 2	Cass£8 (d)
NUMBER GAMES	Cass/EC£7.50 (d)
USING YOUR COMPUTER	Cass£24 (c)

SECONDARY LEARNING

TECHNOLOGY & DESIGN Pt1	£21.50 (c)
ELECTRIC FIELDS	£10.50 (d)
ADVANCED LEVEL STUDIES: STATISITICS	Disc£23 (d)
ADVANCED STUDIES: GEOGRAPHY	Cass£10 (d)
INSIDE INFORMATION	Prog Cass£10 (d)
Book£8 (d)	Audio Cass£5 (d)
SCIENCE TOPICS (ST)	
S.T.:WAVES	Disc£14 (d)
S.T.:RELATIONSHIPS	Disc£14 (d)
S.T.:BONDING	Disc£14 (d)
S.T.:ELECTROMAGNETIC SPECTRUM	(d)
S.T.:ELECTRONICS IN ACTION	Disc£14 (d)
S.T.:NEWTON & THE SHUTTLE	Disc£19 (d)
S.T.:ECOLOGY	Disc/EC£19 (d)
S.T.:POLYMERS	Disc/EC£19 (d)
S.T.:CLASSIFICATION & PERIODIC TABLE	Disc£20 (d)
S.T.:FOOD & POPULATION	Disc£20 (d)
SEC.SCIENCE MICROTECHNOLOGY	Cass£7 (d)
SEC.SCIENCE:THE MOLE CONCEPT	Disc/Aud/EC£16 (c)

GENERAL

VU-TYPE PROFESSIONAL	Disc£19 (d)
WHITE KNIGHT MK II (for 1770 DFS)	Disc£16 (d)
BATTLEFIELDS	Cass£8.50 (d)
A VOUS LA FRANCE	Cass/EC£17 (d) Book£5.25 (d) Audio Cassettes (2) £7.50 (a)
Additional charges for discs	£9.00 (d)
DEUTSCH DIREKT	Disc/aud/EC£16 (c) Book£5.95 (d)
BLACK QUEEN A long awaited bridge game. (1770DFS)	£13(d)
BISMARCK History of the famous battleship. (1770DFS)	£13(d)

Cassette based programs listed above can be supplied on disc at an extra charge of £1.50 per disc and please specify the format required 40 or 80T.

TECHNOMATIC

305 Edgware Road, London W2 Tel: 01-723 0233

BOOKS

No VAT Carriage Code (c)

LANGUAGES

6502 Assy Lang Prog	£19.95
6502 Programming	£13.95
8086 Book	£23.95
Acorn BCPl User Guide	£15.00
Acorn FORTH	£7.50
Acorn LISP	£7.50
Acorn ISO Pascal Ref Manual	£10.00
Intro to COMAL	£10.00
Intro to LOGO	£7.50
Micro Prolog Ref Manual	£10.00
Introduction to Turbo Pascal	£14.95
Prog the Micro with Pascal	£8.50
The Supervisor's BBC Micro	£10.95

BBC MICRO GUIDE BOOKS

Inside Information	£8.95
Maths Prog in BBC Basic	£7.95
The Friendly Computer Book	£4.50
Toolbox 2	£10.95

ARCHIMEDES

Archimedes Reference Manual	£29.95(b)
ARM Assembly Language Prog	£12.95(b)

PROGRAMMING/UTILITY

Advanced Sideways Ram User Guide	£9.95
Advanced User Guide (BBC)	£15.95
Applied Assembly Language on the BBC	£9.95
BBC Micro Advance Programming	£9.95
BBC Micro Ref Guide (B Smith)	£10.95
BBC Micro Sideways ROM's RAM's	£9.95
Guide to the BBC Rom	£9.95
Beginners Guide to W.P.	£7.95
Mastering Assembly Code	£8.95
Mastering Interpreters & Compilers	£14.95
Master Operating System	£12.95
Mastering View, Viewsheet & Viewstore	£12.95
View by B. Smith	£12.95
View 3.0 User Guide	£9.00
Viewstore User Guide	£9.00
Viewsheet User Guide	£9.00
Wordwise Plus	£9.95

SOUND & GRAPHICS

Computer Graphics & CAD Fundementals	£9.95
Mastering Music	£6.95

DISC DRIVE SYSTEMS

Advanced Disc User Guide	£16.95
Disc Book	£3.50
Disc Programming Techniques	£7.95
Disc Systems	£6.95
File Handling on the BBC	£6.95
Discovering Disc Drives	£POA
Practical Disc File Techniques	£5.95
Mastering the Disc Drive	£12.95
Mastering DOS plus	£12.95

APPLICATIONS

Interfacing Proj for BBC	£6.95
BBC and Small Business	£5.75
The Software Business	£5.50

Mastering Operating System
(David Atherton) £6.95

WYSIWYG PLUS

WYSIWYG PLUS is a printer and screen utility for Wordwise Plus, View, Interword, and Basic users, supplied on a 16K Eprom. To obtain a particular printer effect, such as enlarged text, it used to be necessary to discover the appropriate 'printer control code' from your manual and incorporate it into your text. Secondly, you had to print several trial copies in order to position the effect correctly in relation to the rest of your text.

WYSIWYG PLUS simplifies this trial and error approach using easily remembered *commands. For example, *ENLARGED not only selects enlarged text on your printer, but uniquely shows you double width characters on your screen, even from within Wordwise Plus!

WYSIWYG PLUS incorporates a logo editor. Just draw your design on screen using the arrow keys, and save the results. Use the *GRAPHICS command to incorporate your design anywhere in your text; position and see your design in your text before faithfully reproducing a hard copy.

There is also special help for daisy wheel users. The *WHEEL command will prompt you to change daisy wheels whenever a change in type style is about to occur.

WYSIWYG PLUS is designed to work with the following systems:

BBC Model B	6502 Second Processor,	BBC Master 128	All printers (Except lasers)
BBC Model B+	Turbo coprocessor	BBC Compact	

WYSIWYG PLUS workspace is relocatable.

MAYA TERMINAL EMULATOR

A comms package for the professional user. MAYA emulates DEC VT52, VT100 and Tandberg TDV2215. Special BBC VDU mode allows full access to the BBC VDU driver.

Menu driven software allows the setting up of parameters and function key definitions which can be saved to disc for future use.

Flexible command parser provides a uniform user interface and allows full access to * commands and HELP facilities.

Xmodem and Kermit file transfer protocols are included as standard. Unique feature of MAYA is that Kermit can also be used in 'remote mode', which allows file transfers to be initiated by other computers connected to the BBC. File transfers can also be done with a 'dumb' ASCII protocol. Open architecture allows for expansion and addition of new features. Options currently under development are graphics drivers for Tektronix 4010/4014 emulation, TDGR driver for TDV2215 and a Viewdata patch (provisional version included in the current issue). Registered users will be provided with regular updates and customisation service will also be available to those interested.

The package comprises of a rom, utils disc and a comprehensive manual. It is compatible with Master, Models B & B+. It supports DFS, ADFS, NFS and ANFS filing systems.

BLACK QUEEN

A contract bridge program from BBC Publications both for beginners and for club players. Features include rebid and/or reply of any deal just played. Deals can be saved to a disc. Unique feature of Black Queen is its ability to construct deals from standard or classic ones in newspapers etc.

Compatible with Master, B and B+ **£13(d)**

EDUCATIONAL/FUN SOFTWARE BUNDLE

Wordmover		Drawstick
Wordplay	Pantry Antics	Locomotion

These programs are supplied from the BBC Publications Educational Software range and will be supplied on a 5.25" disc for BBC Master, B+ and B and on a 3.5" disc for the Compact.

5.25" Disc	**£17.50(d)**
3.5" Disc	**£18.50(d)**

(Normal RRP over £40)

VU-TYPE

Do you have finger trouble when typing?
Do you letters look like this?
Dear Sor,
I wuold like to…
then you need:

VU-type, a complete touch typing program produced by BBC/Pitman.

It allows you to learn at your own pace and has a wide range of exercises. Screen displays show the keys you have pressed and it will report on your speed and accuracy.

Supplied on a 40T Disc with a manual.

Available at a special price of £7.50(d) instead of the usual £15. Offer valid while stocks last.

BISMARCK

An enthralling game of strategy involving the famous German battleship of the same name.

You can play the role of British Navy in its quest to find the Bismarck and sink it or take either British or German role against another player. It requires the highest qualities of judgement, observation and decision to plan strategy and tactics to plot the death of Bismarck. **£13(d)**

PRINTER ACCESSORIES

EPSON ACCESSORIES:

Interfaces

8143 RS232	£30 (d)
8148 + RS232 + 8k	£65 (d)
8177P NLQ for FX80 +/FX100 +	£99 (d)

Parallel & Serial Buffers of various size also available.

LQ800 Tractor Feed	£47 (b)
LQ1000 Tractor Feed	£52 (b)

SHEET FEEDERS:

LQ800	£135 (b)
LQ1000	£179 (b)
EX800	£135 (b)
EX1000	£309 (b)
FX800	£135 (b)
FX1000	£179 (b)

Ribbons:

RX/FX100/100 +, FX105	£7 (d)
RX/FX80/80 +, FX85	£4 (d)
LX80/LX800	£4.50 (d)
LQ800	£8.50 (d)
LQ1000	£10 (d)
EX800/1000	£7.50 (d)
H180 Pen Set (Aqueous/Ball point)	£8.25 (d)

HITACHI 672 Plotter

Aqueous Pen Set six pens	£18.50 (d)
Oil Based Pen Set six pens	£25.00 (d)

TAXAN CANON Accessories:

Ribbon, KP810/815/910/915	£6 (d)

Star Printer

NL10 Sheet Feeder	£52 (b)
NL10 Ribbon	£4.50 (d)

National Panasonic KX P1080/81

Spare Ribbon	£4.50 (d)
KXP3131 Tractor	£90 (a)
KXP3131 Sheet Feeder	£189 (a)

JUKI 6100

Tractor Feed	£149 (a)
Ribbon (Carbon)	£2.00 (d)
Sheet Feeder	£219 (a)

BROTHER HR20

Tractor Feed	£116 (a)
Spare Ribbon Nylon	£3.00 (d)
Spare Ribbon Carbon	£4.50(d)

INTEGREX INK JET COLOUR PRINTER

Spare Ink Cartridge Black	£9 (d)
Spare Ink Cartridge Colour	£15 (d)
Paper Roll	£7 (d)

Printer Leads:

BBC Parallel Lead (1.2m)	£6 (d)

PAPER & LABELS

Plain Fanfold paper with micro perforations:

2000 sheets 9½" × 11" 60 gsm/sq m	£12 (£3.50)
2000 sheets 14½" × 11" 60 gsm/sq m	£18.50 (£4.50)
1500 sheets A4 90 gsm	£18 (£3.50)

Labels/1000:

Single Row 3½ × $1\frac{7}{16}$"	£5.25 (d)
Triple Row $2\frac{7}{16}$" × $1\frac{7}{16}$	£5 (d)

TECHNOMATIC

17 Burnley Road, London NW10 1ED Tel: 01-208 1177

NOVACAD

Computer Aided Draughting for the BBC Micro

> *"Novacad can drive a plotter to provide drawings of a high quality… Novacad is excellent. It is flexible, genuinely easy to operate without much practice, and a pleasure to use."* **Beebug December 1986**

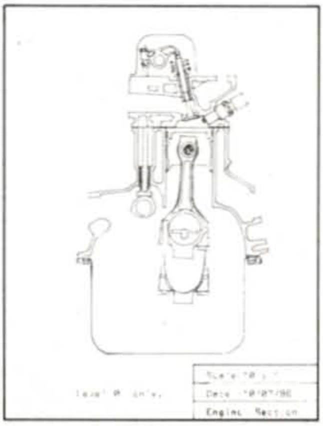
> *"Novacad is a professional package, well worth the £90 for the ROM and disc and is expandable to suit your own particular requirements. I would have no reservations if I heard Novacad called, "the best on the market"."* **A&B Computing August 1986**

A sophisticated CAD package with unique facilities which are generally confined to the professional CAD packages costing thousands of pounds.

NOVACAD is being used in widely differing fields ranging from leading British industries for producing engineering drawings to Accountants' offices for producing flow charts. Architects, engineers, plumbers, kitchen planners and many other professions requiring easy to use facilities for producing professional quality output are making extensive use of NOVACAD's unique features. NOVACAD is proving to be a invaluable teaching aid in technical schools and colleges simply because of the ease with which it can be used.

NOVACAD'S MAJOR FEATURES

- Simple and easy to use with logical command sequence.
- A large drawing area (approx 15 screens).
- The ability to create complex icons (upto 500 lines instead of the usual 15 to 20 pixels), store them in a library and recall them at different scales and orientations.
- A zoom facility allowing magnification of up to 20 times to insert finer details.
- Block copy of shapes on the screen for repetitive use.
- Text entry at any 90° orientation at any position on the screen.
- Create multi layer drawing with 8 levels available.
- Full compatibility with the BBC range with minimal hardware requirements yet having the capability of exploiting the potential of the extra shadow memory or the second processor's memory and speed.
- Printer routine for Epson 80 and 136 column printers.
- A unique optional facility to output to any BBC compatible plotter.
- Cursor control from keyboard, tracker ball or mouse.



NEW REDUCED PRICE

£49(d)

Plotter Driver Generator £15(d)

NOVACAD is compatible with all BBC models fitted with Acorn DFS. It has minimum hardware requirements of a single drive and a Epson compatible printer to get started though NOVACAD will utilise fully a dual drive system and 6502 2nd processor or the shadow ram on the B+ series. To obtain high quality drawings we recommend a BBC compatible plotter and our plotter driver generator.

With basic BBC B, NOVACAD operates in mode 4 allowing use of any 2 colours. With shadow memory of the BBC+ or the Master, it can also operate in mode 0 for higher resolution or mode 1 for allowing use of any 4 colours, and it will provide additional user memory for more complex drawings.

6502 second processor or the Turbo on the Master will also increase the drawing speed considerably.

OPTIONAL EXTRAS

Plotter driver generator is available as an optional extra to configure a plotter routine for any BBC compatible plotter. Pre-configured programs for the popular plotters like **Epson HI 80, Hitachi 672, Plotmate, Penman** and **HP GL.** This program allows the drawing to be scaled to the maximum plotter size thus enabling drawing of A2 and A3 sizes to be produced with equal ease. The zoom facility will enable inaccuracies of drawing on the screen to be eliminated.

BBC SPARE PARTS

BBC B & General

Power Supply	**£52.00 (b)**
Keyboard Connector	**£5.00 (d)**
Complete Keyboard	**£52.00 (b)**
Keyswitch (state type)	**£1.75 (d)**
Modulator UM1233	**£4.80 (d)**
Video ULA	**£18.00 (d)**
Serial ULA	**£14.00 (d)**
ADFS ROM	**£26.00 (d)**
6502A	**£5.50 (d)**
17.734 MHz Xtal	**£2.50 (d)**
16 MHz Xtal	**£2.50 (d)**
6522A	**£5.50 (d)**
6845SP	**£6.50 (d)**
DS3691	**£4.50 (d)**
88LS120	**£6.50 (d)**
LM324	**£0.45 (d)**
SAA5050	**£9.00 (d)**
UPD7002	**£7.00 (d)**
NE555	**£0.50 (d)**
68B50	**£2.50 (d)**
74ALS245	**£5.00 (d)**
WD1770	**£24.00 (d)**
68B54	**£8.00 (d)**
75159	**£2.20 (d)**
76489	**£4.00 (d)**

BBC B +

Keyswitch (state type)	**£1.75 (d)**
Modulator UM1233	**£4.80 (d)**
B+ OS	**£18.00 (d)**
PAL16RH	**£18.00 (d)**

BBC MASTER

Power Supply	**£65.00 (b)**
Keyboard Connection	**£3.75 (d)**
Keyboard	**£65.00 (b)**
Keyswitch (state type)	**£1.75 (d)**
1 Mb OS ROM	**£39.00 (d)**
CF30060 ULA	**£10.00 (d)**
CF30047 ULA	**£15.25 (d)**
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EpromRyter

EpromRyter

*Highly sophisticated & Advanced Programmer

*Handles all current single rail Eproms

*State of the Art Programming Algorithms

EpromRyter is a powerful eprom programmer designed for use with the BBC Master Computer. It takes full advantage of the latest developments in the eprom technology and the extra facilities on the Master to provide fast, simple and efficient programming and editing facilities.

The software is totally menu driven and on screen help messages make the programming simple for both specialists and novices alike.

The EPROMRYTER interfaces with the Master through 1 MHz bus. It is mains powered with its own psu. 3M Textool zif socket has been fitted to ensure consistent and reliable service over long periods.

NEW LOW PRICE £89 + VAT

The single rail eproms handled by the EpromRyter are:
- 2716 2732 2764 27128 27256 27512 27513 27011 2516 2532 2564 (NMOS & CMOS)
- One time eproms P27XXX, 87CXXX etc.
- Also A suffix eproms such as 27XXXA

The main features of the programming software are:
- Device, function and voltage selection from the computer keyboard.
- Continuous display of the options selected.
- All eproms upto 27512 (64K) programmed in single pass.
- Automatic Intelligent identifier support for eproms able to respond.
- Selectable programming voltage 25/21/12.5V
- 3 programming methods: Normal, Intelligent & Pulse (30 sec for a 27128).
- Serial port protocols **supported incl Intel Hex & Motorola S.**
- DFS, NFS, ADFS and Rom Filing System Supported.
- BASIC/Machine Code programming using RFS.
- Powerful editor with input in HEX or ASCII. * Full editable 64K file.
- Block move of data within the address range.
- User can select any section of the eprom from single byte to the full address range to blank check/burn/verify. Facility to program single bytes makes program development/amendment simpler.
- Multiple loading for ROM Filing System

Some of the above features apply to Master Computers only

EPROMER II

A proven Eprom programmer for BBC Model B and B+ with thousands in use in industry, educational and R&D establishments. It offers many of the powerful features of the EpromRyter and can program all single rail eproms upto 27256. Full details on request.

META Version III

"All the good features you would expect to find in a good source code editor are present . . . Meta assembler lives in a different world. It is structured to work with any new processor . . . as new instruction sets can be added . . . as needed . . . has a well featured editor with colour highlighting, a sound modular approach."
Acorn User October 1986

- Assembles for over 30 popular processors, including Z80, 6800/01/02/04/05/09/11 etc — and 68000 — using native mnemonics for each processor, eg. LD A, (HL) for Z80 and MOV AO, $1000 for 68000 etc.
- Fully integrated Editor: four field, all search, search/replace, block copy, delete, move, marked save, load etc.
- Compatible with Portal Eprom Emulators and Team Disassemblers.
- Send object code in Intel Hex, S-Record, straight binary etc. down to discs, RS232, parallel port, Eprom Emulators etc — all **during Assembly.**
- Over 50 directives included as standard: handling nestable macros, conditional assembly and twenty types of table definition directives.
- 32 bit labels; 31 character names. Arithmetic and Boolean arithmetic to 32 bits.
- Modular source code with numeric and string parameter passing.
- Serial communicator area with eight options lines: echo, control code trap, LF supression/addition etc.
- Over 500 in use throughout the world in universities and many different industries.
- Two 16K Roms, two 80 track discs, A4 ring-band manual, function-key strip.

PORTAL EPROM EMULATORS

- Emulates 2716, 2732, 2764, 27128, 27256, 27512 eproms at 150ns Access time.
- Load at 4Kbytes/second — No "erase" time.
- 28 pin header plugs into Eprom socket on target system — status monitored on 13 Leds.
- Fully software controlled from Meta Assembler.
- 100 times faster than standard EPROM program/erase cycle.
- Fully CMOS compatible; draws no power from target system.
- Four portals may be independently programmed off same user-post cable.
- Complete with all cables, manual and disc.

PORTAL 512 (2716, 2732, 2764, 27128, 27256, 27512).

TEAM DISSASSEMBLER

The third part of the Universal Development System: a Meta labelling dissassembler.

Supports 1802, 8080, 8085, HD64180, Z80, 65XX (includes 65 col, 6511 etc), 68XX (includes 00, 01, 02, 03, 08 etc):

- Up to 64K of object code translated back into META compatible source code modules: labels automatically inserted on all jump targets, memory references etc.
- Pre-editing stage allows marking of object code areas as byte, string, word, long word etc, tables. These areas dis-assembled into appropriate directives instead of garbage mnemonics.
- Reconstituted source code ready for immediate re-assembly by META.
- Omniversal search/replace for re-naming arbitary label names with meaningful ones.

NEW

THE TECHNOMATIC BBC CATALOGUE
REVISED WINTER CATALOGUE

This advertisement can only show an example of the range of products stocked by Technomatic. So send for our latest BBC catalogue providing detailed information and prices on BBC Computer Systems, Peripherals, Software and Books. To obtain your free copy please complete and return the coupon below.

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NEW

P.M.S.

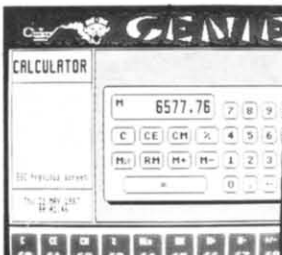
ONLY £25 INC VAT

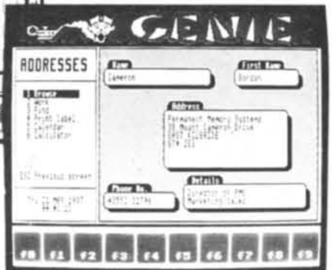
PROUDLY ANNOUNCE

GENIE Junior

NOW AVAILABLE— A DISK BASED VERSION OF THE HIGHLY ACCLAIMED GENIE "POP-UP" SOFTWARE.

requires no special hardware—Just 1 ROM + 1 Disk


GENIE
CALCULATOR
M 6577.76
7 8 9 *
C CE CM % 4 5 6
M± RM M+ M- 1 2 3
0
ESC Previous screen
f0 f1 f2 f3 f4 f5 f6 f7


GENIE
ADDRESSES
Name
Cameron
First Name
Gordon
Address
Permanent Memory Systems
38 Mount Cameron Drive
EAST KILBRIDE
G74 2ES
Phone No.
03552 32796
Details
Director of PMS
Marketing/Sales
ESC Previous screen
f0 f1 f2 f3 f4 f5 f6 f7 f8 f9

A simple key press (CTRL-Shift-G) halts the current task—requests you insert the GENIE Disk and GENIE Junior responds, "Your Wish is My Command". When finished—a single key stroke drops you back to exactly where you left off.

GENIE Junior "Pops-up" from within Basic, Wordwise, the Inter Series, the View Family, Ultracalc and virtually all serious software.

GENIE Junior has exactly the same, highly praised, desktop utilities as its battery backed big brother—notepad, address book, diary, calendar and calculator—but Junior stores all its data on disk, not battery backed RAM.

WHAT THE PRESS SAYS ABOUT GENIE

"MICRO USER" Oct 87 . . . *stunningly simple to use . . . neat, well packaged, well written . . .*

"ACORN USER" Aug 87 . . . *Genie is a superb package . . . I couldn't be without it . . .*

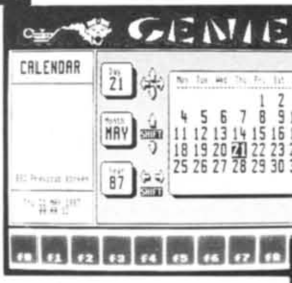
"Pop. Comp. Wkly" June 87 . . . *rapidly becomes an integral part of your system . . . well designed . . .*

"A&B Computing" June 87 . . . *extreme friendliness of design . . . eminently practical piece of software . . .*

"Your Computer" July 87 . . . *a product which can stand alongside its 16 bit role model . . . one piece of software I have always wanted . . .*

"BEEBUG" Aug 87 . . . *extremely versatile . . . a most useful piece of firmware . . .*

Clearly the reviewers wanted Genie—now you can afford to have one!

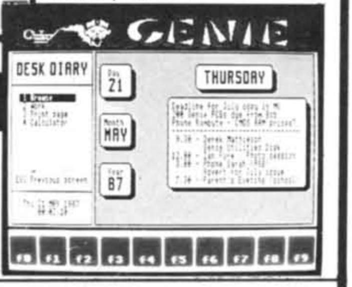

GENIE
CALENDAR
Day 21
Month MAY
Year 87
SHIFT
ESC Previous screen
f0 f1 f2 f3 f4 f5 f6 f7 f8

Mon	Tue	Wed	Thu	Fri	Sat	Sun
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

GENIE Junior is available for all BBC Micros — B, B+, Master 128, Compact.

Disk formats supported—3.5", 5.25", DFS, ADFS (Ramdisk/Winchester/Network versions will be available—Contact Sales Office before ordering).

Compatible with sideways RAM, Shadow RAM, 65C02/512/Z80 second processors.


GENIE
DESK DIARY
Day 21
Month MAY
Year 87
THURSDAY
ESC Previous screen
f0 f1 f2 f3 f4 f5 f6 f7 f8 f9

NEW

MASTER CARTRIDGE GENIE

For all you MASTER users who are short of ROM sockets— here is a version of GENIE which simply plugs into one of the cartridge slots. All the features of the original, battery backed GENIE in a cartridge with a high quality gold edge connector.

ADDITIONAL SIDEWAYS RAM. Since each cartridge slot is effectively 2 ROMS sockets, and GENIE only occupies one of them, PMS can fit an optional 16K of sideways RAM inside the GENIE cartridge. This can be used in exactly the same way as the MASTER's internal sideways RAM. The additional sideways RAM costs £15, and must be specified when ordering GENIE.

NEW

GENIE UTILITIES DISC – MORE WISHES GRANTED

OTHER PMS PRODUCTS

Write or phone for information sheets.

		Price (£) Inc VAT
NEW	GENIE MASTER CARTRIDGE	79.35
	(extra 16K sideways RAM)	15.00
	GENIE IN A BOX (battery backed)	79.35
NEW	GENIE JUNIOR (disk based)	25.00
NEW	GENIE WATCH (RTC for the BBC)	29.90
NEW	GENIE UTILITIES DISK	9.95
	B2P-65CO2 BBC 2nd Processor *NEW PRICE*	89.95
	HIBASIC (disc or ROM)	5.00
	HiWORDWISE PLUS (for B2P only)	6.00
	E2P-65CO2 Electron 2nd processor	79.00
	Electron WORDWISE PLUS (requires E2P)	34.95
	MULTI-FONT NTQ (2 ROM set)	34.00
NEW	NTQ FONT LIBRARY DISKS (12 fonts each)	15.00
	THE NTQ HANDBOOK—by Dave Futcher	9.95

Carriage: under £50—add £1, over £50—add £2.

Overseas: deduct VAT and add £4 carriage.

Contact Sales Office for details of Educational Bulk Discounts and Site Licences.

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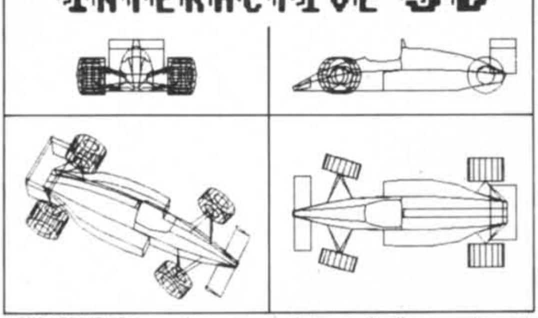
INTERACTIVE 3D



INTERACTIVE 3D is a unique program that actually allows you to create a design directly in a 3D view. And you can zoom, rotate and change view at any time to visualise the effect of design changes. Full editing facilities allow you to create and delete points and lines, and adjust their positions in any direction, all under cursor control without having to enter any numerical data. Circles can be generated automatically and symmetrical forms can be created by reflections. Designs can be saved to tape/disc and reloaded. Views shown on the screen can be saved or printed. Altogether, nearly 50 operations are included.
For BBC B, B+ and MASTER series.

- Acclaimed in reviews (Micro User, Beebug, A&B etc)
- Widely used in schools, colleges and industry
- Licenced to Education Authorities
- Sold in nearly 20 different countries worldwide
- Probably the most powerful 3D CAD system for any home micro, and at an unbelievably low price

£8.95 cassette £12.95 disc (state 40 or 80 track)

DESIGN DYNAMICS

Cheque/PO to: DESIGN DYNAMICS,(C)
8 Meadow Way,
Ampthill,
Bedford MK45 2QX

MODE-00 DUMP

640 X 512

RESOLUTION BREAKTHROUGH!

The BBC computers have quite high resolution graphics. The maximum horizontal resolution of 640 is good but the overall effect is spoilt by the mediocre vertical resolution of 256, even in MODE 0. The same limitation applies to normal screen dumps, so the only way to obtain smooth curves has been an expensive plotter.
Nothing can be done about the screen resolution, but now our unique software, MODE-00 DUMP, provides a means of outputting graphics to a dot-matrix printer at an amazing 640 x 512 resolution. All you have to do is add two simple *SPOOL statements to your BASIC or machine code program. All the VDU data used to plot the picture are then saved to disc for use later by MODE-00 DUMP. Your program can run in any MODE - even MODE 7! (although then you won't see the results until you run MODE-00 DUMP). The dump is in one colour (i.e. as MODE 0) and covers most of an A4 page.
A useful graph plotting program is included as an example to show you how to add the *SPOOL statements to your own programs.
MODE-00 DUMP for BBC B, B+ and Master computers on 5¼" disc.

£12.95 disc only (state 40 or 80 track)

Please note: MODE-00 DUMP works with most dot-matrix printers, but if ESC"*" is not available (check your printer manual) then you have to omit from the dump 6% of the screen height (either top or bottom).

SPECIAL OFFER: (40 or 80 track disc only)
INTERACTIVE 3D + MODE-00 DUMP £20.00

You can save INTERACTIVE 3D pictures to use with MODE-00 DUMP

PINEAPPLE SOFTWARE

Programs for the. BBC model 'B', B+, Master and Master Compact with disc drive

DIAGRAM II

- now also available for ARCHIMEDES

Diagram II is a completely new version of Pineapples popular 'Diagram' drawing software. The new version has a whole host of additional features which make it into the most powerful and yet quick to use drawing program available for the BBC micro. The new features mean that 'Diagram II' can now be used for all types of drawings, not just circuit diagrams. Scale drawings are possible and the facilities for producing circles and rubber banded lines together with the pixel drawing routines make any type of drawing possible. This advert has been produced completely using Diagram II.

Summary of Diagram II features:-

1. Works on all model BBC computers and makes use of Shadow memory if poss.
2. Rapid line drawing routines with automatic joins for circuit diagrams.
3. Rubber band line and circle drawing modes.
4. Makes use of the Acorn GXR rom to produce ellipses, arcs, sectors, chords and flood filling.
5. Pixel drawing mode allows very fine detail to be added.
6. Defined areas of screen may be moved, copied, deleted or saved to disc.
7. On-screen cursor position indication allows scale drawings to be made.
8. Keyboard keys may be defined to print User Defined Characters allowing new character sets to be used.
9. Wordprocessor files may be loaded and formatted into defined areas.
10. Up to 800 UDC's if shadow memory available, 381 without shadow.
11. Compatible with Marconi Trackerball and most makes of 'mouse'.
12. All 'Diagram Utilities' are included.
13. Completely 'scaleable print routines allow any area of the diagram to be printed either horizontally or through 90deg. in scales that may be varied in 1% steps allowing up to 18 mode 0 screens to be printed on an A4 sheet (still with readable text).
14. Smooth scrolling over the whole area of the diagram.

Diagram II consists of a set of disc files and a 16k Eprom. The disc is formatted 40T side0 and 80T side2. Please state if this is unsuitable for your system, or if you require a 3.5" Compact disc

DIAGRAM II - £55.00 + vat P & P free

MARCONI TRACKERBALL

For Model 'B' and B+ (with Icon Artmaster)	£ 60.00	+ vat
For Master 128 (with Pointer Rom)	£ 60.00	+ vat
Bare Trackerball (no software)	£ 49.00	+ vat
Pointer Rom (available separately)	£ 12.50	+ vat
Trackerball to mouse adapters	£ 8.00	+ vat
Postage and Packing on Trackerballs	£ 1.75	

PCB

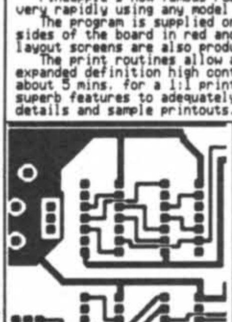
Pineapple's now famous PCB drafting aid produces complex double sided PCB's very rapidly using any model BBC micro and any FX compatible dot-matrix printer.

The program is supplied on Eprom and uses a mode 1 screen to display the two sides of the board in red and blue either separately or superimposed. Component layout screens are also produced for a silk screen mask.

The print routines allow a separate printout of each side of the board in an expanded definition high contrast 1:1 or 2:1 scale. The print time is typically about 5 mins. for a 1:1 print of a 7" * 5" board. This program has too many superb features to adequately describe here, so please write or 'phone for more details and sample printouts.

£ 85.00 + vat

Plotter driver to suit most plotters £ 35.00 +vat



PCB AUTO-ROUTING

This brand new addition to the PCB program greatly increases the power of the software and speeds the design of PCB's even more.

A list of up to 190 connections may be entered in the form of a 'rats nest' and then the computer does the rest! You may specify which side of the board you wish a track to be on or you may leave the choice to the computer, and you may also say whether tracks should be allowed to pass between I.C. pins.

The program is in the form of a second Eprom and full features are available on a standard model 'B.'

Please write or 'phone for full details.

COMPLETE AUTOROUTE PACKAGE (Including manual Eprom) £ 185.00 + VAT

ADFS Utilities Rom

ADU is an invaluable utility for all ADFS users. It adds over 22 new *commands to the ADFS filing system as well as providing an extensive Menu facility with over 35 sub commands covering areas such as repeated disc compaction, saving and loading Rom images, auto booting of files and many more.

Copying of DFS discs onto ADFS discs can be made in one pass with automatic creation of the required directories on the ADFS disc. All functions are fully compatible with Winchester drives including *BACKUP which allows backing up of Winchesters onto multiple floppies.

New *commands are as follows:- *ADU, *BACKUP, *CATALL, *CHANGE, *DFSADFS, *DIRALL, *DIRCOPY, *DIRDESTROY, *DIRRENAME, *DISCEDIT, *DRIVE, *FILEFIND, *FORMAT, *KILLADU, *LOCK, *MENU, *PURGE, *PWRBRK, *UNLOCK, *VERIFY, *VFORMAT, *WIPE

PRICE £ 29.00 + vat

MITEYSPICE - Powerful A.C. & D.C. circuit analyser package - £119.00 +vat with Graphics output. Send for more details

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Access

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Telephone: 0209-831274 and ask for Colin

Archimedes

Put your Micro in the picture!

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We design and manufacture the most comprehensive range available of genlock and vision mixing systems for all models of Acorn/BBC micros including the ArVis audio/video interface for the Archimedes. Use our products to combine video pictures with captions, sub-titles, data and graphic images generated by your micro. Our systems are already in world-wide use by professional TV studios, educational, industrial, government and scientific establishments

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When you buy 25 disks (DS/DD)
for only £18.75
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Including VAT + postage

Alternatively buy 100 5.25" ds/dd disks certified to 96tpi for an incredible £49.95 and get the box free!!

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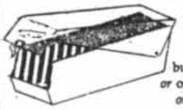
Subtract 5% for SS/DD. Add 10% for reversible DS/DD
Please state Japanese Higrade when ordering

with unique **5** year Guarantee

FREE 3.5" Disk Offer (worth £9.95)



90 Capacity Lockable disk box for 3.5" disks when you buy 50 3.5" disks (or more) *or* only £2.50 when you buy 25 *or* £4.50 when you buy 10

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250	£239.95	£269.95
500	£459.95	£519.95

All disks are supplied with full user labels

FREE SOFTWARE

Palace of Magic

If you already have a disk box, you may like to choose a FREE (or cheap) program with your disks instead.
If you are buying 25 disks (£18.75) or 50 disks (£28.95) or 100 disks (£49.95) then choose any one of the programs below, paying only the price in brackets (many free!!)
Many other games in stock please phone

BBC DISC 5.25" GAMES

	Our Normal Price	Special Price
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Sphere of Destiny	9.30	(FREE)
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Airwolf	11.65	(3.00)
Commando	11.65	(3.00)
Paperboy	11.65	(3.00)
Cholo	14.00	(6.00)
Sentinal	11.65	(3.00)
Yie ar Kung Fu	10.10	(1.00)
The Kat Trilogy	9.30	(FREE)
Apocalypse	11.65	(3.00)
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Imogen 80 Track	7.75	(FREE)
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Micropower Magic 2	6.20	(FREE)
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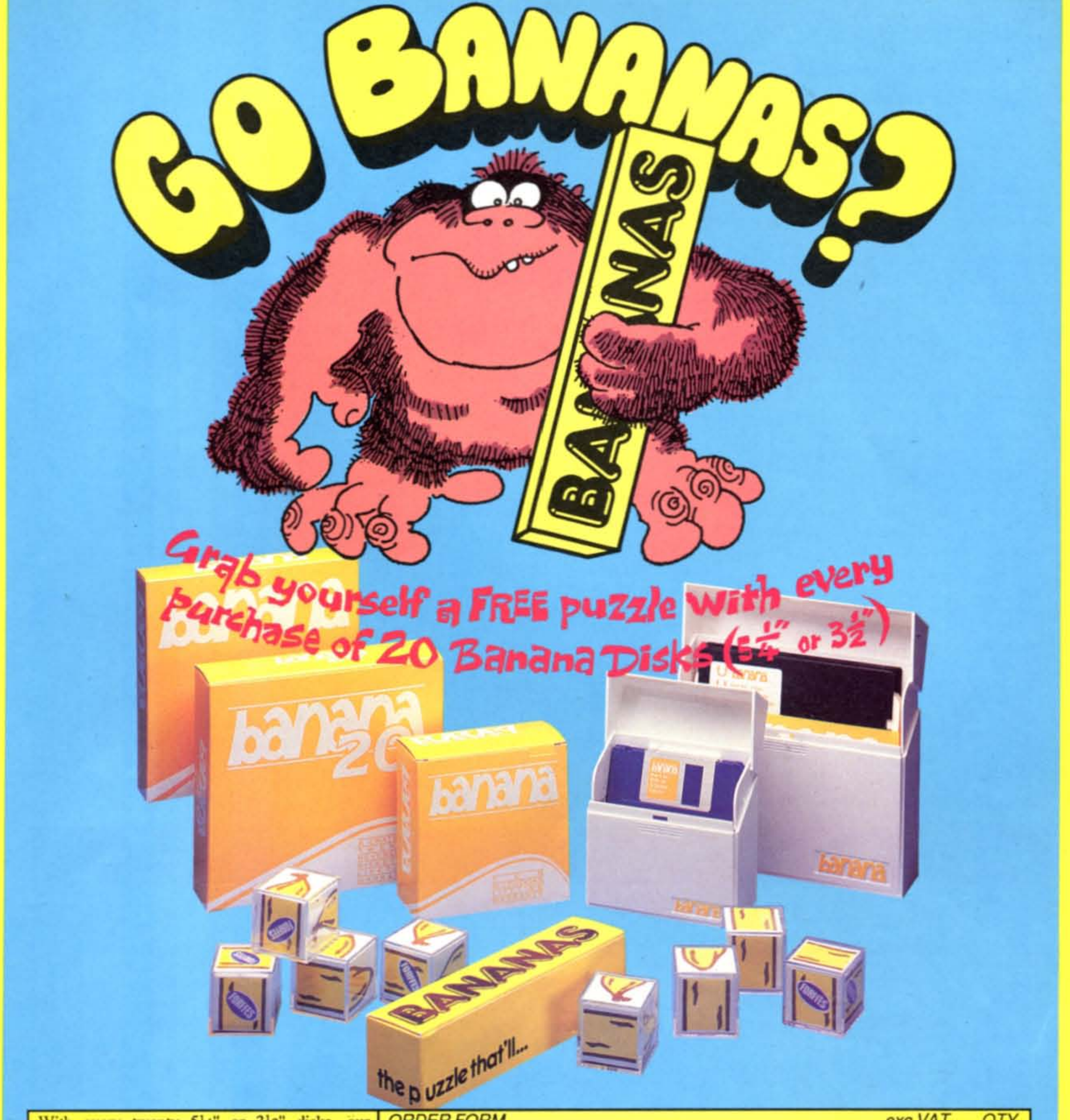
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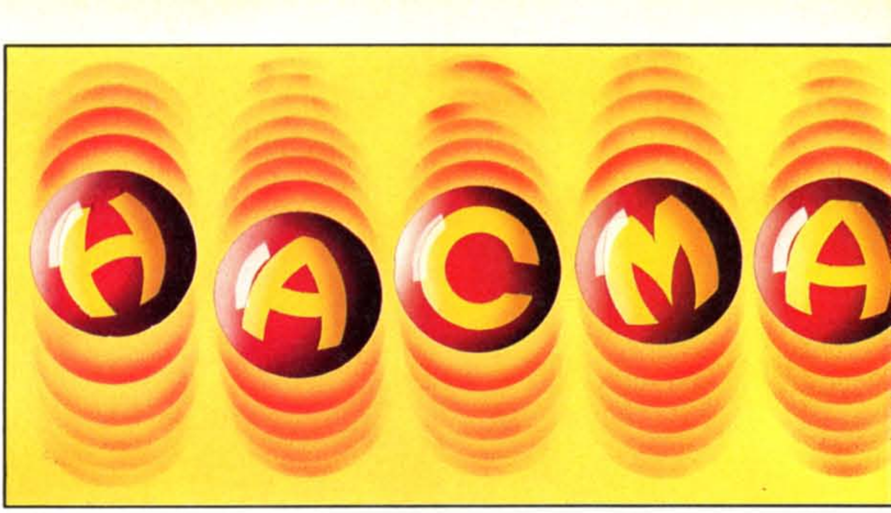


TO follow last month's **Airwolf** *feature, here is a conversion for the main machine code loader file – WOLF2 – so that the defined characters used on the title page are displayed correctly on the Master, without needing to use the Convert program. Simply add the lines in this month's Listing I to last month's Listing I.*

This routine reads the data stored in pages &23 and &24 – memory locations &2300 to &24FF – and outputs it as VDU23 character definitions. It's a machine code version of the short Basic routine published in last July's column. The only difference is that the Basic version only issued the character definitions from data stored in page &C.

This routine converts all the data starting at page and finishing at the beginning of page *end* into definitions for characters starting with *char*. When I wrote the Basic routine it did not occur to me that anyone would store character data anywhere but page &C...

```
   45 oswrch=&FFEE:char=&A0:page=&23:
end=&25
   63 LDA#char:STA &70:LDA#0:STA &71:
TAY:LDA#page:STA &72
   64 .nextchar LDA#&17:JSR oswrch:LD
A &70:JSR oswrch
   65 LDX#&08:.loop LDA (&71),Y:JSR o
swrch:INY:DEX:BNE loop
   66 INC &70:CPY#0:BNE nextchar
   67 INC &72:LDA &72:CMP#end:BNE nex
tchar
```

Listing I: Airwolf title screen modification

On the B and B+ machines, the character font is initially imploded. This means that Ascii characters 32 to 126 are defined by the data stored at memory locations &C000 to &C2FF in the Mos rom, and characters 128-255 are undefined.

Of these last 128 characters, up to 32 – characters 128 to 159 – can have definitions assigned to them. Each definition takes eight bytes, so 32 would take 256 bytes – one page of memory. The page used for storing these definitions is &C.

On all Acorn machines the OS variable OSHWM points to the lowest page in memory that is free after all hardware and software expansions have claimed workspace. Its value is used for the default setting of the Basic variable PAGE – the start of a Basic program. On a cassette-based BBC B, PAGE is &E00.

Although a number of expansions require part of the user ram as workspace, probably the most important is the disc filing system. Adding a DFS to a BBC B pushes PAGE up to &1900. The B+, which has the DFS supplied as standard, already has PAGE set to &1900. As previously mentioned, the B and B+ allow for 32 redefinable characters, for which one page of memory is reserved.

We can increase this number – 32 characters at a time – by reserving further pages of memory, using the *FX20 call. In technical jargon, this is called exploding the character font. We can issue the command *FX20,1 to reserve

Going Crazee on a BBC B

I often feature routines to convert games written for the BBC B to run on the B+ and Master. Regular readers may remember a routine from last May's column that converts the Master version of the hugely successful **Stryker's Run** *to run on a suitably expanded BBC B.*

Although Stryker's Run was the first game to feature a version specifically for the Master, a few others have followed in its footsteps.

Kevin Edwards' **Crazee Rider** *is one such game, with a six-minute musical accompaniment, demo mode and enhanced graphics.*

I was, therefore, very pleased to receive a routine from Gavin Long of Ton Pentre, Mid-Glamorgan to allow the disc version to be used on a BBC B with the Solidisk Fourmeg ram board. Enter Listing II and save it on your own blank disc as Convert. Then insert the Crazee Rider disc and type:

```
LOAD"MENU"
200 GOTO 270
270 PAGE=&1100:CHAIN"CONVERT"
```

Delete lines 10 and 70 and save this file as CRAZEE on your own disc. Then type:

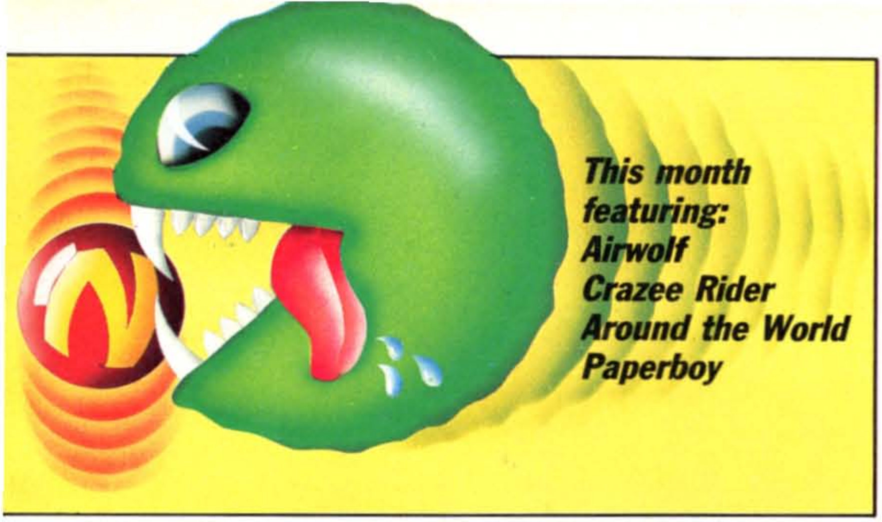
```
CHAIN"CRAZEE"
```

There will be a few disc accesses and then a blank screen. Insert the original Crazee Rider disc and press any key. The Master version of Crazee Rider will now load and run. Thank you very much, Gareth.

One problem with the Master version of Stryker's Run is that it was written using the extended 65C02 opcodes and will not run on a standard 6502. However, Kevin Edwards assures me that he has not used any 65C02 codes in Crazee Rider. It should therefore be possible to convert the Master version of Crazee Rider to run on other systems with at least 64k of sideways ram.

```
   10 REM Crazee Rider to Solidisk 4M
   20 REM By Gareth Long
   30 REM (C) The Micro User
   40 REM
   50 ON ERROR GOTO 100
   60 A=GET:*INIT
   70 *RUN O.EMU6845
   80 HIMEM=&787F:LOMEM=&6700:?&FE32=
8:*LOAD MCRLOAD
   90 ?&51A=8:?&51D=&32:?&540=&32:?&5
B9=&9B:CALL &500
  100 *LOAD MCRIDER
  110 ?&499=&60:CALL &400
  120 P%=&D88:[OPT 0:STX &FE32:STX &F
E30:RTS:]
  130 P%=&D78:[OPT 0:STA &FE32:STA &F
E30:RTS:]
  140 FOR A=1 TO 13:READ J%:PROCconv(
1,J%):NEXT:READ J%:PROCconv(2,J%)
  150 ?&1B4E=9:?&1B61=9:?&1B9E=9:?&1B
DD=9:?&1BB3=9:?&A06=10:?&1C27=10:?&20
2A=8:?&206A=11:?&2089=8:?&209F=11:?&2
36F=8:?&240D=8:?&2430=8:?&2627=8:?&26
51=8
  160 CALL &664B
  170 END
  180 DEFPROCconv(I%,J%):IF I%=1 THEN
 ?J%=&20:?(J%+1)=&78:?(J%+2)=&D ELSE
IF I%=2 THEN ?J%=&20:?(J%+1)=&88:?(J%
+2)=&D
  190 ENDPROC
  200 DATA &A09,&A1E,&1C2B,&202E
  210 DATA &206E,&208D,&20A3,&2373
  220 DATA &2411,&2434,&262B,&2655
  230 DATA &2EC0,&2EB5
```

Listing II: Conversion for Crazee Rider to Solidisk 4Meg board



This month featuring:
Airwolf
Crazee Rider
Around the World
Paperboy

one page, allowing us to redefine characters 160 to 191.

The command *FX20,6 fully explodes the character font, allowing all characters from 32 to 255 to be redefined. The side effect is that we lose six pages of memory, pushing OSHWM – and therefore PAGE – from, say, &1900 to &1F00.

Acorn has always said that the *only* legal way to issue character definitions is by VDU 23,x,... However, on the B and B+ machines any data stored in page &C is automatically converted into character definitions. Many commercial games cut corners by transferring data directly into page &C, in the knowledge that the operating system would do the rest.

Some, such as Hunkidory and Starship Command, have more than one set of definitions – one set for the game and one for the high score table, for example – which are simply transferred into page &C as needed. The method itself is illegal in Acorn's eyes – but until the advent of the Master there was never any reason to suspect that it would ever fail to display the characters correctly.

When the character font of the BBC B or B+ is exploded, all pages allocated for character definitions operate in the same way as page &C. Any data loaded into them will automatically become character definitions.

As an example, on a disc-based BBC B or B+ we can issue the command *FX20,1 to allow Ascii characters 160 to 191 to be defined. This pushes OSHWM up from &1900 to &1A00. If we then *LOAD a 256-byte datafile at &1900 and examine characters 160 to 191, we will find that they now have the definitions given by the data in the page starting at &1900.

Equally, if we *LOAD the same data at &1900 and then issue the command *FX20,1, we will achieve the same result. We have arrived at the heart of Airwolf's problem.

The exact technique used by Airwolf to display the title page characters is very clever, and it is most unfortunate that it does not quite conform to legal Acorn compatibility rules.

The main machine code loader file, incorporating the title page – WOLF2 – loads at &1960. The data for the character definitions is stored in the two pages &23 and &24. As we have seen, when the character font is exploded, the pages immediately above OSHWM are reserved for storing the definitions for the new redefinable characters. Airwolf actually resets OSHWM to &2300 and then issues the call *FX20,2, thereby defining characters 160 to 223.

The Master series doesn't work in this way. The character font of these machines is fully exploded on start-up, using seven pages of the private Mos ram. Therefore any attempt to generate defined characters by direct manipulation of the main user memory will fail. To cope with this different setup, the machine code routine in Listing I reads the two pages of definitions data and issues the necessary series of VDU 23 commands.

Incidentally, Elite's **Paperboy** – by the same author – also features this illegal method of generating defined characters on the title page. Fortunately, the fix is just as simple. Enter last month's Listing I, add this month's Listing I, delete lines 70, 80, 100, 110, 120 and 130 and change line 140 to read:

```
140 .cli EQUS"LOAD PAPER"+CHR$13
```

Paperboy's character definitions are stored in pages &22 and &23, so you must also change the values of *page* to &22 and *end* to &24. The title page will now be correctly displayed. Many thanks to Chris Hardcastle for the loan of Paperboy to check the above.

I've been hacking away for *The Micro User* for a year now and I'd like to thank you for the letters and contributions you've sent me. Although I try to answer every query or request for help, I can't undertake to do so if I don't receive a stamped addressed envelope.

Next month's column will include a full solution to Superior's excellent Codename:Droid. Until then, play on!

Around the World passwords

***Around the World in Forty Screens** has attracted a lot of interest so here, at last, are all the passwords.*

They've been a long time in coming because I am honour-bound not to give more than brief details of any game that has a competition running. Many thanks to everyone who has written in with the passwords: I'm sorry that I cannot mention names, but I'd fill up the whole column without mentioning anything else.

I was very surprised to see how quickly I received the passwords: Are you all sure you didn't cheat?

Further to my fix for the bug in the first release of Forty Screens, Stephen Willetts and James Walsh have written to me to ask if there are any other bugs – they're both stuck on screen F of America.

I can say for certain that there are no bugs on this screen: Apart from anything else, I've completed it myself. Steve Botterill of Superior assures me that the Orient bug is the only one in all the releases of Around the World. Keep trying!

	America		**Arctic**		**Orient**		**Oceans**		**Africa**	
Screen	**Password**	**Edit code**	**Password**	**Edit code**	**Password**	**Edit code**	**Password**	**Edit code**	**Password**	**Edit code**
A	AMERICA	52463	ARCTIC	25363	ORIENT	10019	OCEANS	34645	AFRICA	53997
B	CURTAIN	57036	DIAMOND	20049	THRUST	47727	MAGENTA	44892	WELCOME	54996
C	VAMPIRE	2457	RUBBISH	44028	COLONEL	29389	ELECTED	15334	WORKING	36857
D	CREATED	2560	MANAGER	10455	PERSONS	29842	DISEASE	14536	FIREMAN	13942
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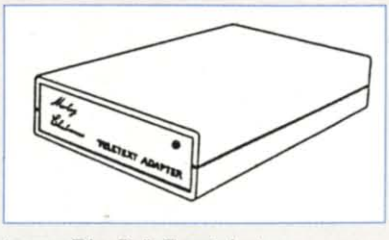

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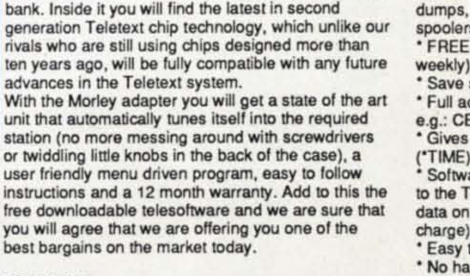

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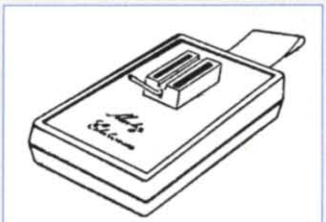


The MORLEY EPROM PROGRAMMER V2 is a small self contained unit that plugs into the BBC or MASTER user port. It comes with a high quality ZIF (zero insertion force socket) and contrasting plastic case. Also included in the package is it's own user friendly menu driven software on ROM or disc.

This state of the art unit, allows programming of 2764 (8k), 27128 (16k), and 27256 (32k) EPROMS. Not only does the hardware allow programming of the usual NMOS devices, but will handle the new generation CMOS equally as well, and with the average time taken to program a 16k at less than 30 seconds we believe it to be one of the fastest programmers available today.

THE HARDWARE

The Unit is completely under software control, there are no knobs or switches to baffle the novice, and the extended features provided should excite the pro's.

THE SOFTWARE

The comprehensive user friendly software included in the package has two main parts, the first allows EPROMS to be read, programmed, verified and edited, also allowing a ROM image to be loaded or saved to disc. The second is a full ROM management system in its own right, which has a host of useful features and routines, such as KILL and RESURRECT ROM to disable or enable a sideways ROM, dump ROM image to buffer or disc, move ROM image in buffer to sideways RAM, and VIEW-SEARCH any sideways ROM.

The whole system is available now for less than the price of one WORDWISE chip. So get yourself the all new MORLEY EPROM PROGRAMMER V2 today and start using those expansion boards for what they were made for! ROMS.

Immediate delivery no quibble 12 month guarantee.

MASTER CARTRIDGE

Designed and manufactured by Care Electronics to Acorn specifications. These high quality Master expansion cartridges will take two 16k sideways ROM's, and will, unlike similar cartridges available from other manufacturers, accept the new second generation programs, such as Computer Concepts Interword and Spellmaster ROM's.

These Cartridges come in a high quality, robust, formed-plastic case, that fits neatly into either one of the Master's cartridge slots.

MASTER SMART CARTRIDGE

This device was designed and manufactured jointly by Morley and Care Electronics.

The **Smart** cartridge will at the press of a button halt any program running in memory and execute any one of a host of useful built in, or user defined procedures, and once completed will return to the program and continue where it left off. The only limiting factor with this device is the programmers imagination.

The **Smart** cartridge will prive useful to the novice, allowing him to do the simple things like dump any screen to printer, and make backups of protected tape or disc based software, but has an open ended specification for the advanced 'HACKER' allowing advanced programming techniques to be incorporated into almost any program at the touch of a button.

BUILT IN FEATURES (at the press of a button)

Autosaves computer's entire memory.
Freeze program at any point.
Screen dump (any mode) to printer or disc.
Allows any OSCLI command without disturbing memory.
Copies 90% of protected software.
Tape to disc, disc to tape.
User friendly menu.
Sound On/Off.

ALL CARTRIDGES COME WITH A 12 MONTH NO QUIBBLE WARRANTY

NEW PRODUCT

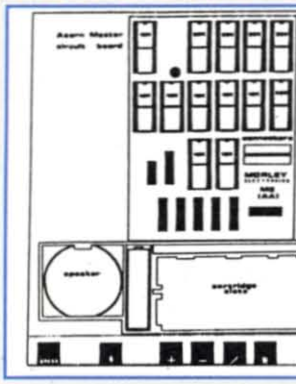
MORLEY MASTER BOARD 'AA'

MORLEY
E·L·E·C·T·R·O·N·I·C·S

At long last the add-on all MASTER users have been waiting for, an internal ROM board.

No more need to turn the computer off to insert the cartridge containing the ROM you need to debug the program in memory.

The new **MORLEY MASTER BOARD "AA"** allows you to have up to 8x16k and 4x32k extra Roms installed inside your MASTER and still leaves the cartridge slots free. This in effect allows your MASTER to support as many as 24, 16k ROMs installed permanently, whilst retaining the standard 4 x sideways ram banks and four banks by using cartridges



Unit 3, Maurice Road Industrial Estate,
Wallsend, Tyne & Wear NE28 6BY
Telephone: Tyneside (091) 2627507
Telex: 265871 A/B MONREF G
(Quoting Mag 70211)

A staggering 32 ROM images installed and accessible at any time

Included in the package is a utility ROM which has many useful features such as 'FICOPY', a clever file transfer program that transfers files between DFS and ADFS formats or vice versa.

So for less than the price of four external cartridges you get a MASTER BOARD "AA" which with twice the capacity has got to be **THE** ROM expansion for the serious MASTER user.

The unit comes with the usual Morley, full no-quibble twelve months warranty, and our usual after sales service

THE COMPLETE RANGE OF TELETEXT SOFTWARE from M/B SOFTWARE

***NEW . . . DESIGN 7 PLUS** – now 'the best' is even better. Held in high regard by reviewers and hundreds of satisfied owners, DESIGN 7 has been further improved, with revised keystrip & even more features. Design/load/save and MODE 7 screen with ease, up to full CEEFAX/Oracle standard. Will convert ANY MODE 7 screen to a BASIC procedure, for inclusion in your own programs. ROM version includes a file copier, printer dumps useable from BASIC etc. B/MASTER/COMPACT.

TELETEXT EMULATORS/SCREEN DISPLAYS/INFORMATION SYSTEMS – A complete range of teletext programs to cater for all needs, with full teletext adapter interfacing.

***NEW . . . DESFAX** – totally new version – streets ahead of the competition – run your own information/display system. Stores hundreds of screens on dual 80 track drives (96 screens on single-sided 40 track), with access to any screen with a SINGLE KEYPRESS. Lots of special effects – screens can scroll, slide, overwrite etc. Animation, loops, subroutines – send for details – not enough space here to even begin to describe the advanced features!! B/MASTER/COMPACT

***NEW . . . MASTERFAX** – 84 MODE 7 screens in memory at once. 148 screens possible with cartridge RAM. An advanced teletext/carousel program featuring SINGLE KEYPRESS or 3-digit page selection. Runs entirely from memory – no disc accesses after pages are loaded. Superb animation and other effects. MASTER/COMPACT only.

***NEW . . . VU-FAX** – 1000 screens and no disc accesses! Screens stored on MORLEY 1MByte RAM DISC. SINGLE KEYPRESS gives instant access to any screen (or emulate teletext). This is the ultimate MODE 7 screen management system – there is nothing else like it. MODEL B/ MASTER 128.

***ALSO . . . MASTERcopy** – DFS/DFS, DFS/ADFS, ADFS/DFS, ADFS/ADFS file copier. Uses the MASTER 128's memory to the full to permit fast disc copying. 31 DFS files to ADFS disc in less than 2 minutes. Creates directories automatically. You will wonder how you ever managed without this program. Described by reviewers as 'unexcelled'. MASTER 128 and COMPACT's fitted with DFS ROMS.

ORDER FORM

To order simply complete and return by post enclosing your cheque/P.O. made payable to Morley Electronics, or by phone during office hours, quoting your ACCESS or VISA number.

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Telex: 265871 A/B MONREF G (Quoting Mag 70211)

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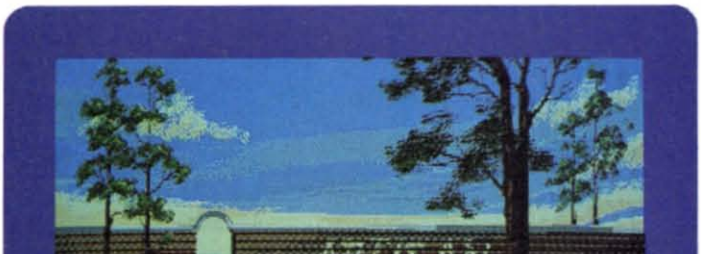
Archimedes
HARNESS THE POWER



A computer like ARCHIMEDES needs software that can match its outstanding capabilities. Our new products do just that and one of the first areas that you will want to explore is the graphics capability. ARTISAN, from the authors of ARTROOM, is the ultimate in graphics packages. Just take a look at the screen shot reproduced here, as they say 'a picture is worth a thousand words'. We can't describe all the features here but some major functions are:

- Full screen
- Fast multi level scrolling zoom
- Image distortion
- WIMP environment
- Magic brush
- ECF designer

Plus all the usual features and some very unusual ones too.

£39.95

PICTURE THIS

—COMPETITION—

Can you do better than the picture shown here? If so you could win yourself a unique prize. If yours is judged to be the best picture then your masterpiece will be transferred to canvas by our artist Jon Warmisham (BA Hons Fine Art). The competition is open ended but the best picture each month will be featured in ACORN USER and a monthly prize will be awarded. Full details are contained in the ARTISAN pack.

Alpha-Base

Alpha-Base is the successor to the hugely successful Beta-Base, the top selling database for the BBC micro. Beta-Base files can even be transferred to Alpha-Base.

Alpha-Base incorporates all the suggestions and requests that we have received over the last five years. All of the standard Beta-Base facilities are there but in a much improved form. In addition there are many new features that will make your life easier. Some of the features are:

- Free format screens
- Multiple pages per record
- 400 fields & 27,600 characters per record
- 2.14 billion records per file
- Multiple display & entry forms
- Fast search & sort options
- Plain English entry of search criteria
- Five data types including formula & date
- Winchester compatible

At Clares we try to give you usable programs. This results in some arbitrary limits on the size of files in Alpha-Base. The limits of 400 fields and 27,600 characters per record are unlikely to restrict you but they enable us to save memory and provide additional features. The only other limitations are due to the hardware. Alpha-Base can handle 2.14 billion records but the ADFS can't!

£49.95

IMAGE WRITER

IMAGE WRITER is a sophisticated WIMP based wordprocessor with the ability to include graphics as well as to use various font combinations. Because Image Writer is document based you do not have to create page layouts for every page. You prepare your whole document in one go. Just type it, add the graphics and print it—simple. The graphics can be created with the built in graphics editor. Image Writer is designed as a first level DTP product and it uses the normal printer fonts to print both text and graphics in one pass. We will of course be producing a full feature DTP when ARCHIMEDES supports the fancy font printing. Image Writer will be available when you read this so please contact us for more information.

£29.95

clares

ARCHIMEDES TOOLKIT MODULE

ATM is the first toolkit available for this powerful new micro. Many of the features that made RAMROD a top seller have been incorporated into ATM and a whole host of new features have been added including:

- 10 Memory and disc editors
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- A scrolling disassembler
- A one line assembler (accessed from the disassembler)
- Shift and compare functions
- Catall and Exall for discs
- Winchester compatible

If you want to explore your ARC then order the ARCHIMEDES TOOLKIT MODULE today. It has enabled us to disassemble modules, discover many undocumented SWI calls and has been an invaluable aid in debugging software. You can even search for mnemonics.

£39.95

Archimedes is a trademark of Acorn Computers Ltd

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☎ Access

DON'T FORGET, YOU CAN ORDER WITH ACCESS CARD TOO!

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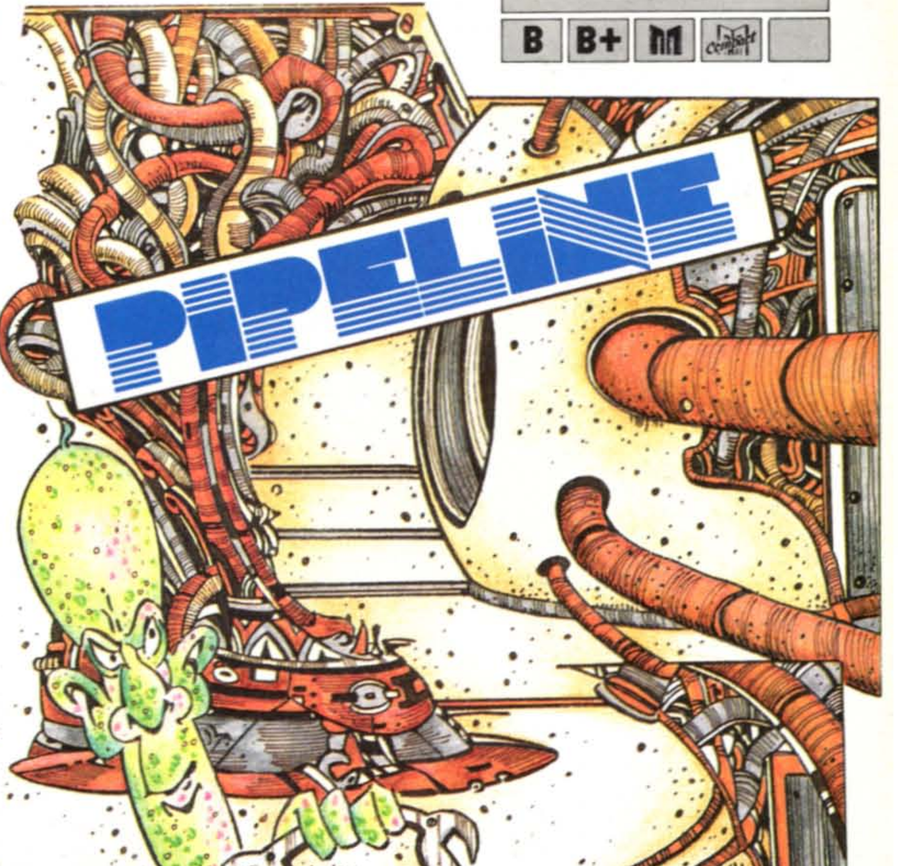
James Bee presents a game for all plumbers

PIPELINE



THE inhabitants of the far off planet of Boswyte have just repelled an attack from the evil Leaks, but unfortunately their pipes suffered terrible damage. However, the plumbing droids are on hand to effect repairs rapidly before the problem gets out of hand.

Their task is quite simple – to repair the pipes before the pressure build-up becomes too much. Apart from the time limit, some of the terrible Leaks are still lurking among the joints and will teleport the plumbing droid back to his starting position on contact.

To fix the pipe, move the plumbing droid around the screen picking up the pieces of broken pipeline and placing them in their correct positions. You can access the main plumbing map three times to find out where the pipe should go before the circuits burn out due to flooding from the unrepaired pipes.

The piece you are holding is displayed in the box in the bottom right corner of the screen and when you place it in the correct position the screen will flash blue.

You score five points for each corner piece placed correctly and a point for each straight one. Happy plumbing!

CONTROLS

Z	Left
X	Right
:	Up
/	Down
Return	Take a piece of pipe
Shift	Drop a piece of pipe
H	Help
Q	Quit current game

PROCEDURES

left	Move droid left
right	Move droid right
up	Move droid up
down	Move droid down
udlr	Calculate *pmem* from direction of droid
title	Clear screen and print game title
pick	Pick up a piece of pipe
put	Put down a piece of pipe
hlp	Display complete pipe for three seconds
scr	Calculate score and bonus
nastie	Calculate direction of the nastie and move it
setst	Set droid to starting position
dis	Display the hi-score table
hi	Should your score be in hi-score table?
input	Input routine for name
sp()	Print a sprite
dh()	Print double-height string
copy()	Copy data from memory to playing area memory
disp()	Display data on screen
d()	Time delay
read()	Read data

VARIABLES

time	Delay to next time limit beep
scr	Score
level	The level/pipe you are on
Q	Flag to say whether you've run out of time or quit
C	Colour of double height text
X	X coordinate of double-height text
Y	Y coordinate of double-height text
nx	Nastie X position
ny	Nastie Y position
nastmem	Location of nastie in playing area data
mem	Location of droid in playing area data
piece	Sprite number of the piece picked
pmem	Location to check before moving
G$	Key check
A$	String to be printed in double-height
N$	Name to be entered into hi-score table
N$()	Name in hi-score table
SC%()	Scores in hi-score table
SC%	Set to *scr* after each game
A%	Accumulator value before code CALLed
B%	Droid sprite number and direction
H%	Number of times help screen used
I%,J%	Loop count
K%	Key input value
L%	Location to poke blue for water in time limit pipe
M%	Location of data for each level/pipe
N%	Position of new name in hi-score table
R%	Random number
S%	Time setting after each game
T%	Time setting for time delays and tests
X%	Lo-byte of address for code routine
Y%	Hi-byte of address for code routine

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128K ROM

MEGA

MEGA-3 ROM

A single 128K ROM containing INTER-WORD, INTER-SHEET and INTER-CHART. The package contains all manuals, keystrips and quick reference cards supplied with the individual packages, but the software is *all* on one chip, occupying just one ROM socket.

MEGA-3 ROM is compatible with the entire range of BBC Micros: Model-B, B+, B+128, Master and Compact.

Upgrades: Existing owners may optionally trade-in their INTER-WORD, INTER-SHEET or INTER-CHART for a discount of 25% each. This means that existing owners of all three may obtain a trade-in discount of 75%—a cost of just £21.25 + VAT (£24.44 incl.).

Price: full package £85.00 + VAT (£97.75 incl.).

Computer Concepts Ltd

Gaddesden Place, Hemel Hempstead
Herts HP2 6EX. Tel 0442 63933

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ADDRESSES

left	Move droid left
right	Move droid right
up	Move droid up
down	Move droid down
display	Show data on screen with sprites
sp	Print sprite number defined by A
dht	Print double-height character
set1	Print droid
compare	Check if pipe complete
memL	Lo-byte of address
memH	Hi-byte of address
check	Pipe complete flag
area	Playing area data

```
   10 REM Pipeline
   20 REM By James Bee
   30 REM (c) The Micro User
   40 IF PAGE<&1900 THEN PAGE=&1900:CHAI
N"PIPLINE" ELSE GOTO 1970
   50 MODE2
   60 left=&1100:right=&1112:up=&1124:do
wn=&1136:display=&114F
   70 sp=&1222:dht=&11B5:set1=&1148:chec
k=&78:compare=&120C
   80 DIM SC%(6),N$(6):*FX213,1
   90 area=&B00:time=1000:*FX9,1
  100 memL=&70:memH=&71:*FX10,1
  110 FOR I%=0 TO 5:N$(I%)="Micro User":
SC%(I%)=(6-I%)*20:NEXT
  120 PROCtitle:zs$="0000"
  130 PROCdh("Keys",7,6,6)
  140 COLOUR5:PRINT'''SPC4"Z - Left"''S
PC4"X - Right"''SPC4": - Up"''SPC4"/ - D
own"''SPC4"H - Help"''SPC4"Q - End Game"
''SPC4"RET - Pick"''SPC4"SFT - Drop"
  150 PROCdh("Press SPACE to start",0,28
,1)
  160 T%=TIME:REPEAT:G$=INKEY$(0):UNTIL
G$=" " OR TIME>T%+700
  170 IF G$=" " THEN 220
  180 PROCdis:PROCdh("by James Bee",5,29
,9)
  190 T%=TIME:REPEAT:G$=INKEY$(0):UNTIL
G$=" " OR TIME>T%+700
  200 IF G$=" " THEN 220
  210 GOTO120
  220 RESTORE 1960:scr=0
  230 level=1:H%=0:Q=0
  240 VDU12,19,2,0,0,0,0,23;8202;0;0;0;
  250 PROCdh("Pipeline",6,1,3)
  260 A$=STR$scr
  270 PROCdh(RIGHT$(zs$+A$,3),12,29,2)
  280 REPEAT
  290 L%=&7887:?check=199
  300 nx=18:ny=1:piece=0
  310 nastmem=area+ny*20+nx
  320 mem=area+201
  330 READ M%
  340 PROCcopy(M%)
  350 PROCdisp(M%)
  360 FOR I%=&7880 TO &7980 STEP 32
  370 PROCsp(I%,2)
  380 SOUND 2,-9,(I%-&7880)/32+200,1
  390 NEXT
  400 PROCsp(I%,8)
  410 VDU20:PROCbox
  420 PROCd(200)
  430 FOR I%=0 TO &F0
  440 IF ?(M%+I%)<2 OR ?(M%+I%)>7 THEN 4
80
  450 R%=RND(235)
  460 IF ?(area+R%)<>0 OR area+R%=mem OR
 R%=38 THEN 450
  470 ?(area+R%)=?(M%+I%):SOUND1,-2,R%,1
  480 NEXT:PROCdisp(area)
  490 PROCsetst
  500 TIME=0
  510 REPEAT
  520 T%=TIME
  530 REPEAT
  540 PROCnasty
  550 IF INKEY-17 Q=1
  560 IF INKEY-98 PROCleft:GOTO600
  570 IF INKEY-67 PROCright:GOTO600
  580 IF INKEY-73 PROCup:GOTO600
  590 IF INKEY-105 PROCdown
  600 IF INKEY-74 IF piece=0 PROCpick
  610 IF INKEY-1 IF piece>0 PROCput
  620 IF INKEY-85 IF H%<3 PROChlp
  630 PROCd(7)
  640 UNTIL TIME>T%+time OR ?check=0 OR
Q=1
  650 ?L%=48:L%?633=48:L%=L%+8
  660 VDU7
  670 IF TIME>38*time Q=1
  680 UNTIL ?check=0 OR Q=1
  690 S%=TIME
  700 VDU28,1,25,18,6,12,26
  710 PROCdh("Pipe "+STR$level,7,8,6)
  720 IF ?check=0 PROCdh("Complete",6,11
,6):PROCdh("Well done!",5,15,5):GOTO740
  730 PROCdh("Incomplete",5,11,6):PROCdh
("Bad luck",6,15,5)
  740 PROCscr:PROCdh("Press any key!",3,
22,7)
  750 *FX15
  760 G=GET:level=level+1:UNTIL level=5
OR ?check<>0
  770 PROChi:GOTO180
  780 DEF PROCdisp(D%)
  790 X%=D%MOD256:Y%=D%DIV256
  800 CALLdisplay:ENDPROC
  810 DEF PROCleft:B%=14
  820 IF mem?-1 A%=14:CALLset1:ENDPROC
  830 mem=mem-1:A%=0:CALLset1
  840 CALLleft:ENDPROC
  850 DEF PROCright:B%=13
  860 IF mem?1 A%=13:CALLset1:ENDPROC
  870 mem=mem+1:A%=0:CALLset1
  880 CALLright:ENDPROC
  890 DEF PROCup:B%=11
  900 IF mem?-20 A%=11:CALLset1:ENDPROC
  910 mem=mem-20:A%=0:CALLset1
  920 CALLup:ENDPROC
  930 DEF PROCdown:B%=12
  940 IF mem?20 A%=12:CALLset1:ENDPROC
  950 mem=mem+20:A%=0:CALLset1
  960 CALLdown:ENDPROC
  970 DEF PROCpick:PROCudlr
  980 IF ?pmem<2 OR ?pmem>7 ENDPROC
  990 piece=?pmem:?pmem=0:PROCdisp(&B00)
:PROCsp(&7AB0,piece):A%=B%:CALLset1
 1000 ENDPROC
 1010 DEF PROCput:PROCudlr
 1020 IF ?pmem>0 OR pmem=nastmem OR pmem
=&BC9 ENDPROC
 1030 ?pmem=piece:PROCdisp(&B00):PROCsp(
&7AB0,0):A%=B%:CALLset1
 1040 IF ?(M%+pmem-&B00)=piece VDU19,0,4
,0,0,0:PROCd(20):VDU20:SOUND 1,-9,255,2
 1050 piece=0
 1060 X%=M%MOD256:Y%=M%DIV256
 1070 CALLcompare:ENDPROC
 1080 DEF PROCcopy(Q%)
 1090 FOR I%=0 TO &F0
 1100 IF I%?Q%<2 OR I%?Q%>7 I%?&B00=I%?Q
% ELSE I%?&B00=0
 1110 NEXT:ENDPROC
 1120 DEF PROCd(U%)
 1130 E%=TIME:REPEATUNTIL TIME>E%+U%
 1140 ENDPROC
 1150 DEF PROChlp:ZZ%=TIME
 1160 PROCdisp(M%):PROCd(200)
 1170 H%=H%+1:PROCdisp(area)
 1180 A%=B%:CALLset1:TIME=ZZ%:ENDPROC
 1190 DEF PROCdh(S$,X,Y,C):COLOUR C
 1200 LOCAL J%:PRINTTAB(X,Y);
 1210 FOR J%=1 TO LENS$
 1220 A%=ASCMID$(S$,J%):CALLdht:NEXT
 1230 ENDPROC
 1240 DEF PROCsp(loc,F%):A%=F%
 1250 X%=loc MOD 256:Y%=loc DIV 256
 1260 CALLsp:ENDPROC
 1270 DEF PROCudlr
 1280 IF B%=11 pmem=mem-20
 1290 IF B%=12 pmem=mem+20
 1300 IF B%=13 pmem=mem+1
 1310 IF B%=14 pmem=mem-1
 1320 ENDPROC
 1330 DEF PROCnasty
 1340 IF nastmem=mem GOTO 1410
 1350 PROCsp(&3A00+nx*32+ny*1280,0)
 1360 D%=RND(4)
 1370 IF D%=1 IF nastmem?-20=0 ny=ny-1:n
astmem=nastmem-20
 1380 IF D%=2 IF nastmem?20=0 ny=ny+1:na
stmem=nastmem+20
 1390 IF D%=3 IF nastmem?1=0 nx=nx+1:nas
tmem=nastmem+1
 1400 IF D%=4 IF nastmem?-1=0 nx=nx-1:na
stmem=nastmem-1
 1410 PROCsp(&3A00+nx*32+ny*1280,10)
 1420 IF nastmem=mem FOR I%=128 TO 0 STE
P-2:SOUND 2,-9,I%,1:NEXT:A%=0:CALLset1:P
ROCsetst
 1430 ENDPROC
 1440 DEF PROCsetst
 1450 memloc=&3A00+(10*1280)+32
 1460 ?memL=memloc MOD 256
 1470 ?memH=memloc DIV 256
 1480 PROCsp(memloc,11):B%=11
 1490 mem=area+20*10+1:ENDPROC
 1500 DEF PROCbox
 1510 MOVE 1098,104:DRAW1098+104,104:DRA
W1098+104,20:DRAW1098,20:DRAW1098,104
 1520 ENDPROC
 1530 DEF PROCscr
 1540 *FX213,255
 1550 *FX214,1
 1560 FOR I%=0 TO &F0
 1570 IF M%?I%<2 OR M%?I%>7 THEN 1630
 1580 IF M%?I%<>area?I% THEN 1630
 1590 IF area?I%<4 scr=scr+1
 1600 IF area?I%>3 scr=scr+5
 1610 A$=STR$scr:PROCdh(RIGHT$(zs$+A$,3)
,12,29,2)
 1620 VDU7
 1630 NEXT
 1640 *FX213,1
 1650 IF Q=1 ENDPROC
 1660 PROCdh("Bonus!",7,18,3)
 1670 FOR I%=S% TO 37*time STEP time:?L%
=48:?(L%+633)=48:L%=L%+8:SOUND 2,-2,I%,1
 1680 scr=scr+5:A$=STR$scr:PROCdh(RIGHT$
(zs$+A$,3),12,29,2):NEXT
 1690 ENDPROC
 1700 DEF PROCinput:PROCtitle
```

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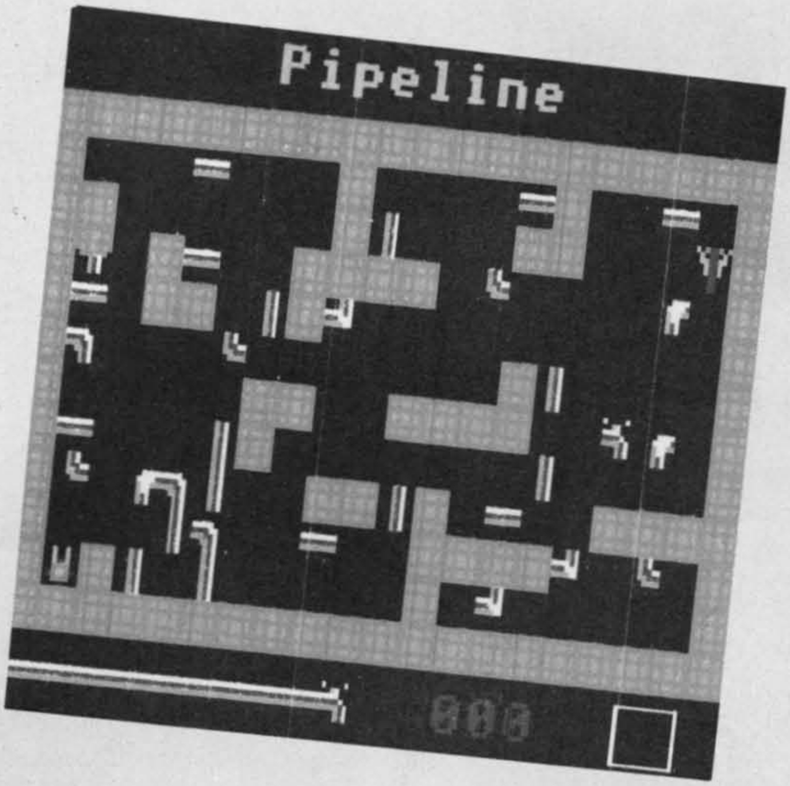
```
 1710 PROCdh("You are in the",2,7,6)
 1720 PROCdh("High Score table!",1,10,6)
 1730 PROCdh("Enter Your Name",2,16,5)
 1740 PROCdh(STRING$(12," "),4,21,132)
 1750 PROCdh(STRING$(12," "),4,23,132)
 1760 N$="":PRINTTAB(5,23);
 1770 REPEAT:VDU23,1,1;0;0;0;:K%=GET
 1780 IF K%=127 N$=LEFT$(N$,LENN$-1):GOT
01810
 1790 IF K%=13 THEN1820
 1800 IF LENN$<10 N$=N$+CHR$K%
 1810 PROCdh(N$+" ",5,22,7):VDU8,10
 1820 UNTIL K%=13:COLOUR128:ENDPROC
 1830 DEF PROChi:SC%=scr:*FX21
 1840 IFSC%<SC%(5) THEN1870
 1850 FORI%=0 TO 5:IFSC%<SC%(I%) NEXT EL
SE FOR J%=5 TO I%+1 STEP-1:SC%(J%)=SC%(J
%-1):N$(J%)=N$(J%-1):NEXT:SC%(I%)=SC%:N$
(I%)="":N%=I%:SC%=0:I%=5:NEXT
 1860 PROCinput:N$(N%)=N$
 1870 ENDPROC
 1880 DEF PROCdis:PROCtitle
 1890 PROCdh("Top  Plumbers",3,6,6)
 1900 FORJ%=0 TO 5:PROCdh(N$(J%)+STRING$
(14-LENN$(J%),"."),2,10+J%*3,5)
 1910 PROCdh(STR$(SC%(J%)),16,10+J%*3,7)
 1920 NEXT:ENDPROC
 1930 DEF PROCtitle:VDU12,23;8202;0;0;0;
 1940 PROCdh("Pipeline!",5,3,3)
 1950 ENDPROC
 1960 DATA &900,&A00,&E00,&F00
 1970 MODE7:RESTORE2150:REM Cut here
 1980 PRINT"Assembling...":*TAPE
 1990 PROCread(&1100,"Code")
 2000 PROCread(&0900,"Pipe 1")
 2010 PROCread(&0A00,"Pipe 2")
 2020 PROCread(&0E00,"Pipe 3")
 2030 PROCread(&0F00,"Pipe 4")
 2040 PROCread(&1320,"Sprite"):*FX18
 2050 FOR I%=0 TO 31:?(&1300+I%)=0:NEXT
 2060 PRINT"Please wait some more...";
 2070 VDU21:*K.0RESTORE2190:I%=(2+!&1C)A
ND&FFFF:REPEATI%=I%-1:U.?I%=13:I%?1=&FF|
MOLD|MFOR I%=0 TO TOP STEP 4:I%!&1500=I%
!PAGE:NEXT|MPAGE=&1500|MOLD|M40|MRUN|F|M
 2080 *FX138,0,128
 2090 END
 2100 DEF PROCread(M%,B$):PRINT B$
 2110 READ Q%:FOR J%=1 TO Q%:READ C$
 2120 !M%=EVAL("&"+C$):M%=M%+4
 2130 NEXT:ENDPROC
 2140 REM Code
 2150 DATA 97
 2160 DATA E970A538,A5708520,8500E971
 2170 DATA 4C0EA971,A5181148,85206970
 2180 DATA 6971A570,A9718500,11484C0D
 2190 DATA E970A538,A5708500,8505E971
 2200 DATA 4C0BA971,A5181148,85006970
 2210 DATA 6971A570,A9718505,11484C0C
 2220 DATA 71A470A6,8E12224C,698C1168
 2230 DATA 8500A911,853AA974,850BA975
 2240 DATA 8500A98B,BD8CA68C,74A69999
 2250 DATA 222075A4,74A51812,74852069
 2260 DATA 006975A5,8CE67585,14C98CA5
 2270 DATA AD18DFD0,14691168,AD11688D
 2280 DATA 00691169,1811698D,806974A5
 2290 DATA 75A57485,75850269,03308BC6
 2300 DATA 6011614C,81A9FFA0,8AFFF420
 2310 DATA 12798D60,79A20AA9,F12012A0
 2320 DATA 2017A9FF,FEA9FFEE,A2FFEE20
 2330 DATA 127ABD00,20FFEE20,E0E8FFEE
 2340 DATA A9F2D004,FFEE2017,EE20FFA9
 2350 DATA 127ABDFF,20FFEE20,E0E8FFEE
```



```
2360 DATA A9F2D008,FFEE20FE,EE200AA9
2370 DATA 2008A9FF,FFA9FFEE,A9FFEE20
2380 DATA FFEE4C0B,8C12158E,EBA21216
2390 DATA DD9999BD,03D00B00,86F5D0CA
2400 DATA 76866078,00A27784,0A0A8F86
2410 DATA 0A8F260A,260A8F26,0069188F
2420 DATA A912458D,8D8F6513,00A01246
2430 DATA 919999BD,7691C876,20E0E8C8
2440 DATA 29981EF0,E8EDD007,E0E8E8E8
2450 DATA 18E5D020,806976A5,77A57685
2460 DATA 77850269,D2D004A2,1D041F60
2470 DATA 00000611,00000000,00000000
2480 DATA 00000000
2490 REM Pipe 1 Data
2500 DATA 60
2510 DATA 01010101,01010101,01010101
2520 DATA 01010101,01010101,00000001
2530 DATA 00000000,00000001,00010000
2540 DATA 01000000,02040101,00000005
2550 DATA 00000001,00010100,01000000
2560 DATA 01030901,01000506,00010101
2570 DATA 05040000,01000000,01070601
2580 DATA 01000301,00000000,03030000
2590 DATA 01000000,00000001,00000300
2600 DATA 00000000,03030100,01000000
2610 DATA 00000001,01010300,01010000
2620 DATA 06030101,01000008,00000001
2630 DATA 04010300,02020202,00070202
2640 DATA 01000000,00000001,07020600
2650 DATA 01000101,00000000,01010101
2660 DATA 00000001,00000000,01000000
2670 DATA 00010101,01000000,00010001
2680 DATA 00000000,01000000,00000000
2690 DATA 01000000,01010101,01010101
2700 DATA 01010101,01010101,01010101
2710 REM Pipe 2 data
2720 DATA 60
2730 DATA 01010101,01010101,01010101
2740 DATA 01010101,01010101,00000001
2750 DATA 09000000,01010000,00000000
2760 DATA 01000000,00010001,07020204
2770 DATA 04010100,08020202,01000000
2780 DATA 00000101,00000003,07040100
2790 DATA 00010000,01010100,00000001
2800 DATA 04000103,00070202,00010000
2810 DATA 01000100,00000001,03000103
2820 DATA 00000000,00000000,01000000
2830 DATA 00000101,03020403,05020202
2840 DATA 00000001,01000001,00010001
2850 DATA 03010706,03000000,01000000
2860 DATA 01000001,00000001,03010000
2870 DATA 03000101,00000000,01010000
2880 DATA 00000001,06000000,07020202
2890 DATA 00010101,01000000,00010001
2900 DATA 00000000,01000000,00000000
2910 DATA 01000000,01010101,01010101
2920 DATA 01010101,01010101,01010101
2930 REM Pipe 3 data
2940 DATA 60
2950 DATA 01010101,01010101,01010101
2960 DATA 01010101,01010101,00000001
2970 DATA 00000001,00000000,00000000
2980 DATA 01000001,00000001,02040000
2990 DATA 02020202,00000005,01000001
3000 DATA 00010101,01030000,01010101
3010 DATA 00000103,01000000,00000001
3020 DATA 02060000,02020202,02020203
3030 DATA 01000502,04000001,00000502
3040 DATA 01000000,00000103,01000300
3050 DATA 03000001,02020601,01000008
3060 DATA 01000103,01090300,03000001
3070 DATA 00000001,01000000,01000103
```

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REALTIME SOLIDS MODELLER

PROFESSIONAL 3D CAD SYSTEMS

Reviews of the original REALTIME GRAPHICS SYSTEM:
"there isn't anything yet available for the Beeb capable of producing such impressive and powerful graphics"-A&B Computing (June '87).
"there is no other software to rival it"-Beebug (April '87).
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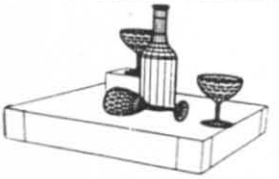

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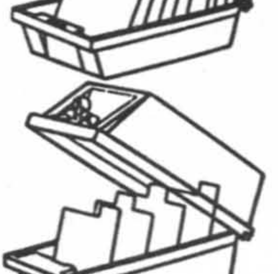

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3090 DATA 02020202,01000007,01000000
3100 DATA 00000001,01010000,00000101
3110 DATA 00000100,01000100,00010001
3120 DATA 00000000,00000000,00000000
3130 DATA 01000000,01010101,01010101
3140 DATA 01010101,01010101,01010101
3150 REM Pipe 4 data
3160 DATA 60
3170 DATA 01010101,01010101,01010101
3180 DATA 01010101,01010101,00000001
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3350 DATA 01000000,01010101,01010101
3360 DATA 01010101,01010101,01010101
3370 REM Sprite data
3380 DATA 112
3390 DATA 13031303,03130313,13031303
3400 DATA 03130313,23032303,03230323
3410 DATA 23032303,03230323,3C3F0000
3420 DATA 00003033,3C3F0000,00003033
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3450 DATA 31313131,31313131,3D3D3D3D
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3470 DATA 00000000,00000000,35000000
3480 DATA 31313131,3F3F0000,3D3D3F3F
3490 DATA 3E3F0000,00003033,3C3F0000
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3520 DATA 00000000,00000000,00000000
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3550 DATA 3C3F0000,00003033,3D3F3131
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3570 DATA 00000000,00000000,3C3F003A
3580 DATA 00002033,3C3F3730,00313133
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3650 DATA 008A8A51,00000000,00000000
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3730 DATA 000A0000,00000A00,00050000
3740 DATA 00000500,040F0000,00000F04
3750 DATA 07030400,00040307,02020000
3760 DATA 00000202
```

This listing is included in this month's tape & disc offer. See order form on Page 159.

Get it right!

```
  10 =    0 0
  20 =    0 0
  30 =    0 0
  40 = 5A88 8
  50 = DA59 D
  60 = D68E A
  70 = E56E C
  80 = B5FA C
  90 = CA1E C
 100 = 668D E
 110 = 6F1D D
 120 = 38DF 2
 130 = 161F 7
 140 = 162B 6
 150 = 3D05 9
 160 = 7691 E
 170 = 8C0B E
 180 = A989 9
 190 = 7691 8
 200 = 8C0B C
 210 = F4BC 4
 220 = EBF7 E
 230 = C7ED 2
 240 = E04E 6
 250 = 3FFF 7
 260 = D23C B
 270 = A982 0
 280 = BFBA C
 290 = F715 C
 300 = D8DD B
 310 = CF3B C
 320 = 885B A
 330 = 8D00 5
 340 = FF7F 1
 350 = FFDE 9
 360 = E1DA F
 370 =  158 7
 380 = 9FF9 7
 390 = 2C83 9
 400 = EE93 2
 410 = 96FC F
 420 = A8A1 3
 430 = F3BF E
 440 = CA9A C
 450 = 679B B
 460 = 4F76 B
 470 = CA4D 3
 480 = A667 3
 490 = 6BEE 6
 500 = 173E 9
 510 = BFBA 8
 520 = 32AD E
 530 = BFBA B
 540 = 4995 7
 550 = 9CE6 3
 560 = 3314 8
 570 = 975B 7
 580 = AAAC D
 590 =  A77 2
 600 = B3CC 9
 610 = 59F6 0
 620 = 21EC 3
 630 = EED8 A
 640 = 6B74 2
 650 = CE34 0
 660 = 4638 9
 670 = 8623 6
 680 = 2827 D
 690 = 6380 7
 700 = 47CA C
 710 = 9A72 B
 720 = DA38 9
 730 =  AE2 4
 740 = 967C 9
 750 = A022 3
 760 = 174B A
 770 =  440 7
 780 = EB80 4
 790 = 68BC 4
 800 = 245A 1
 810 = 95C6 0
 820 = 56E7 F
 830 = FCAD 6
 840 = F3E9 8
 850 = F877 D
 860 = 7145 2
 870 = 73C6 B
 880 = E4D6 3
 890 = C45E E
 900 = 3FB8 6
 910 = 1C55 2
 920 = DB0E A
 930 = EE81 A
 940 = F883 6
 950 = 1732 9
 960 = 51B4 E
 970 = 6DA9 A
 980 = D9E8 6
 990 = 48F7 9
1000 = ED0F D
1010 = 7761 2
1020 = 4186 9
1030 = 1092 1
1040 = A385 F
1050 = 5E1F 3
1060 = 99FF 5
1070 = 87CA C
1080 = 43B2 7
1090 = F3BF B
1100 = 98A9 8
1110 = E531 6
1120 = CFBA C
1130 = 1E4F F
1140 = ED0F 1
1150 = B9AC 7
1160 = 98A8 8
1170 = CDDE 1
1180 = A86E 2
1190 = 339D 1
1200 = 1E93 C
1210 = 4349 9
1220 = FDC0 A
1230 = ED0F C
1240 = BAB0 F
1250 = 815C 8
1260 = FC97 8
1270 = 4CB0 8
1280 = 7F8D C
1290 =  288 3
1300 = 8385 F
1310 = 2168 2
1320 = ED0F 2
1330 = 47E2 7
1340 = 15BE 6
1350 = A75C A
1360 = 7EC7 6
1370 = 25AD 8
1380 = 4228 5
1390 = EF8D 6
1400 = 7F46 7
1410 = A29D C
1420 = 41DD 4
1430 = ED0F D
1440 = 6599 9
1450 = 3759 8
1460 = 25C4 E
1470 = 9CE2 A
1480 = 25CA 1
1490 = E6AC 3
1500 = 81E6 7
1510 = 5597 6
1520 = ED0F E
1530 = 1192 9
1540 = 8372 D
1550 = 85A7 9
1560 = F3BF D
1570 = 19F6 2
1580 = F87F 8
1590 = 46C3 3
1600 = 2910 E
1610 = 7E06 2
1620 = 4638 5
1630 = 2C83 F
1640 =   37 F
1650 = 87DF 6
1660 = 6038 5
1670 = 6A4E E
1680 =   64 9
1690 = ED0F 4
1700 = B3B6 F
1710 = A801 B
1720 = 7C30 2
1730 = 51B5 F
1740 =  C5C 4
1750 = 871C F
1760 = 8292 F
1770 = AB4A F
1780 = 9A28 0
1790 = A0EF 8
1800 = 70C6 F
1810 = 5EDB 6
1820 = C7A3 5
1830 = DE27 8
1840 = 2485 B
1850 = 3624 0
1860 = 9C2C 4
1870 = ED0F 6
1880 = 124F 2
1890 = 4F14 9
1900 = 7341 1
1910 = B801 7
1920 = E531 2
1930 = D509 2
1940 = C172 B
1950 = ED0F 6
1960 = F241 8
1970 = ACA6 A
1980 = 4CB5 8
1990 = 80BF 2
2000 = A733 2
2010 = 9435 8
2020 = A6A8 B
2030 = EC9D 6
2040 = 11F9 8
2050 = 15DC 3
2060 = D7EC D
2070 = 6B15 D
2080 = 5DEC 4
2090 = FD2E 7
2100 = FD95 C
2110 = 3F31 3
2120 = D149 3
2130 = E531 9
2140 =    0 9
2150 = 984E C
2160 = 2A76 E
2170 = 2591 8
2180 = 83C1 4
2190 = A992 4
2200 = 85C1 6
2210 = 3156 9
2220 = DCD4 0
2230 = 90E8 D
2240 = FF93 0
2250 = 2A6A 1
2260 = 3CF4 B
2270 = 4632 E
2280 = 16CE A
2290 = 813B 2
2300 = C4B8 B
2310 = 942E 1
2320 = 617E 0
2330 = F8D3 A
2340 = 16A3 2
2350 = 3072 3
2360 = BDDA 4
2370 = C634 F
2380 = F066 4
2390 = B2D0 A
2400 = 47EB 2
2410 = 35B3 2
2420 = 7E0B 3
2430 = D2DD F
2440 = 5D2C E
2450 =  E9E 2
2460 = D6DE 4
2470 = EB9A E
2480 = A483 0
2490 =    0 0
2500 = F897 3
2510 = 7D42 6
2520 = 5842 F
2530 = 1954 0
2540 = 18AD 6
2550 = C22A E
2560 = AA0C 5
2570 = CE18 7
2580 = 1F80 8
2590 = AFE1 2
2600 =  2BA B
2610 = C6B5 1
2620 =  763 4
2630 = 96BC 4
2640 = 19D6 D
2650 = A73C 9
2660 = BA3E 0
2670 = A0F6 7
2680 = 7464 3
2690 = 13A0 1
2700 = 7D42 1
2710 =    0 1
2720 = F897 B
2730 = 7D42 1
2740 = 5842 E
2750 = 4753 8
2760 = FEF3 B
2770 = ED0A 4
2780 = C114 2
2790 = 795A 6
2800 = 7F70 A
2810 = FC96 E
2820 = 6421 5
2830 =  63B 8
2840 = 7F4E 8
2850 = CA3B 1
2860 = 5A7D 2
2870 =  B45 6
2880 = D101 7
2890 = A0F6 A
2900 = 7464 8
2910 = 13A0 9
2920 = 7D42 3
2930 =    0 3
2940 = F897 5
2950 = 7D42 5
2960 = 5842 E
2970 =  25F 4
2980 = C14B 2
2990 = E0DC 4
3000 = A204 0
3010 = C3B3 C
3020 =  D9B 7
3030 = A383 D
3040 = CA7F E
3050 = 273A 9
3060 = CB10 2
3070 = 1549 3
3080 = AB2E 2
3090 = 8653 6
3100 = F60B 1
3110 = 1897 7
3120 = DC40 B
3130 = 13A0 1
3140 = 7D42 A
3150 =    0 A
3160 = F897 9
3170 = 7D42 5
3180 = 5842 B
3190 = 2AE6 2
3200 =  F75 2
3210 = 4E37 F
3220 = F6AF 5
3230 = 59AC A
3240 = E6B8 C
3250 = 669B 9
3260 = C63A 5
3270 = 3539 1
3280 = BF1A 2
3290 = F170 E
3300 = 9FC3 D
3310 = 3F47 2
3320 = BF18 F
3330 = 9275 7
3340 = DC40 0
3350 = 13A0 4
3360 = 7D42 6
3370 =    0 6
3380 = 59A7 1
3390 = A90C 4
3400 = 6BF7 2
3410 = 8448 A
3420 = 1089 2
3430 = BFFB 8
3440 = 46FD F
3450 = 5BE3 A
3460 = FFAF F
3470 = 6D92 C
3480 = 4F86 0
3490 = 3262 A
3500 =  DD9 A
3510 = 1602 6
3520 = DC40 6
3530 = 3F05 D
3540 = 1089 C
3550 = 4F21 0
3560 = DAB4 3
3570 = 6DD0 2
3580 = 91C4 F
3590 = 7816 B
3600 = 485E F
3610 = 21F7 2
3620 = 5008 F
3630 = 1263 1
3640 = E2C6 F
3650 = AE05 C
3660 = AD39 F
3670 = 7490 E
3680 = EE93 4
3690 = 1EB2 B
3700 = BDEC B
3710 = 333E D
3720 = 1609 3
3730 = 8C9B 8
3740 = BF13 E
3750 = 1C6B F
3760 = EAA1 5
```

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Leaky listings

THIS is the first of an occasional series in which we'll publish program listings that nearly work. Nearly? Well, the idea is to help beginners (and experts too) improve their programming by spotting the deliberate mistakes.

Try your hand at this month's Leaky Listing and see how many errors you can find. You'll find the corrections on Page 161, together with some useful hints for good programming.

```
100 REM Decimal to binary converter
110 REM (c) The Micro User
120 REM
130 MODE 7
140 REPEAT
150 PRINT
160 INPUT "Enter binary: "num$
170 res=0
180 l=LEN(NUM$)
190 FOR n=l TO 1
200 IF MID$(num$,n,1)=1 PROC ans
210 NEXT l
220 PRINT "Decimal=    : ";res
230 UNTIL num$=""
240 :
250 DEF PROCans
260 res=res+2^(l-n)
270 ENDPROC
```

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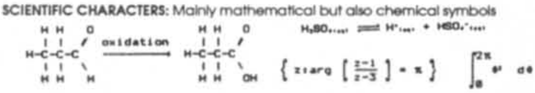
GREEK ALPHABET: Upper and Lower case, upright and italic

Α Β Γ Δ Ε Ζ Η Θ Ι Κ Λ Μ Ν Ξ Ο Π Ρ Σ Τ Υ Φ Χ Ψ Ω

SCIENTIFIC CHARACTERS: Mainly mathematical but also chemical symbols


oxidation
$H_2SO_{4(aq)} \rightleftharpoons H^+_{(aq)} + HSO_4^-_{(aq)}$
{z:arg [(z-1)/(z-3)] = π}
∫₀^2π θ² dθ

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LETTERS

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Printer control from View

I READ with interest the letter from A.L.Gouch in the December issue of The Micro User *giving a method of producing pauses at the printer end when sending data. Unfortunately there seems to be no provision in View for sending instructions to the printer.*

It is possible however – you can create a special printer driver by answering the printer driver generator's Give the Code for obtaining "£" *request with 19 27 10.*

All that is then necessary to implement Mr Gouch's system is to define a footer as /£ and omit the subsequent ///.

This aspect of the Printer Driver Generator can be used for many purposes: For a back space, enter 8. For a circumflex accent, enter 8 "^".

For an e with an acute accent, enter "e" 8 followed by the code for the accent, which will vary from one printer to another. To change the print colour, enter the appropriate code.

Any composite character or printer instruction can be obtained in this way. It's a pity that this very useful facility is limited to #, $ and £, so that only three special codes can be used with any one driver. – **D.V. Meader, London.**

Computer studies

I WOULD like to express the disquiet that I felt when I saw Ms Capper's program in the December 1987 issue.

Did she learn to write code like that on a school computer studies course? If so, her program tends at first sight to support the assertion made on the same page by P.Jones that "computer studies should not be taught as a subject in its own right".

But I think that goes too far. Computer studies makes contributions to the greater understanding of our society and of the technology which is increasingly important in it. For this reason it is valuable.

What is not valuable is the Basic which is usually taught as part of it.

For the overwhelming majority of those who learn it, programming is a useless skill. It may even be harmful to the development of just those logical faculties which it is always claimed to benefit: Ms Capper's program is a fine illustration of this.

The best that you can say for Basic programming is that it can be fun – like crossword solving, but it has about the same practical value.

This has been recognised in the new GCSE syllabus, which permits schools to avoid programming completely if they wish in their examination work. Instead, it stresses the practical use of computers for such tasks as word processing, data retrieval and machine control.

Pupils who use computers in their jobs after leaving school will be using them in these ways, so what they have learnt might be useful to them.

Basic is unlikely to be more than a recreational interest, and only for a very small number of them at that.

Why waste lessons on something that would be better learnt in their spare time by those interested in it?

All of this may turn out to be of purely academic interest in view of the apparent position of computer studies in Mr Baker's proposed national curriculum.

For the moment, however, let's hear the view of teachers and pupils alike on this question: Should we teach Basic programming in computer studies courses? – **Peter Kay, Haverfordwest, Dyfed.**

Win a tenner

● Want to write to The Micro User? The address is: Letters, The Micro User, Europa House, Adlington Park, Adlington, Macclesfield SK10 5NP.

Writers of the most interesting letters receive a £10 prize.

Courtesy always pays

I BOUGHT a Morley Teletext Adapter from your stand at the recent Electron and BBC Micro User Show in London. I soon discovered that the support rom provided was not what it claimed to be, and I had actually been given two ATS roms.

I rang Morley and they were very apologetic and asked me to send one back to them for replacement.

When I did this I also queried a couple of points concerning the graphics dump on the utilities disc which I had not been able to get to work properly with my printer.

I received a reply by return of post with the correct rom and, in their covering letter, as well as being apologetic they were also very helpful and made a genuine attempt to solve my problems.

So much so that they also sent me the new utilities disc in case the one I had was faulty.

In fact, it did not make any difference and I sent it back and then received a further letter from them with more suggestions. I believe my problem is now solved – a printer dipswitch needed altering.

I would like to say how nice it is to deal with such a pleasant, courteous and helpful company. It is also very good business practice for them, as I will certainly be looking to purchase further items from them with confidence.

I would also like to mention that the Teletext Adapter is an excellent piece of equipment. – **G.M. Robertson, Reigate, Surrey.**

● It's good to know which companies provide real after-sales service.

Monster lurking in Zarch

I AM writing to you concerning the game Zarch which I bought recently and have played continuously – stopping only briefly to write this letter.

On the second wave I have come across a strange undocumented alien swimming around in the sea. It is a cross between a large crocodile and a dragon, and moves around in circles, half

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LETTERS

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submerged. Has anyone else seen this creature or is the game going to my head? – **Stuart Cupit, Etchingham, E. Sussex.**

● Yes, we've seen it, and if you hit it you score 1000 points. It appears in every game and remains in place as each wave progresses until you see it and shoot it.

Unfortunately it doesn't stay in the same place for each game – but it does follow a particular positioning sequence from the initial boot-up.

In the first game it appears in a bay halfway to the map edge, north by northwest of the hoverplane launch pad near a sea-based radar station, but where it appears in subsequent games we don't know. Perhaps a dedicated reader will find out.

Viglen solution

I RECENTLY fitted a Viglen console unit to my BBC B and found that a few minutes after power-up the keyboard interrupts went berserk.

I phoned Viglen who suggested swapping over the 6522 VIAs. I tried this, but to no avail. However, I found that replacing the long curly keyboard lead with the original short link appeared to cure the problem – but then the case wouldn't fit.

I phoned Viglen again. They suspected a faulty keyboard lead and sent me two different ones: Another curly one and a long straight one. But both gave the same problem.

I thought that the problem may be due to RF interference or crosstalk, and they suggested shortening the cable. Unfortunately that didn't work either.

Finally a friend suggested that I use a parallel flat ribbon cable. So I phoned Viglen again, and they sent me a 1.5 metre cable they normally use for connecting up disc drives.

The cable was 34-way and the keyboard connector was 17-way, but they fitted. Each signal was then separated by an unconnected line and to my surprise it worked perfectly – though it was not quite as pretty as a curly lead.

I would like to thank Viglen for their helpfulness, and to point out this possible solution to anyone who is having this problem with their console units. – **Stephen Murgan, Leystonstone London.**

Reminders in View

I KEEP a number of different View files on disc containing letterheads, addresses, invoices and so on. I have found it useful to have a note in each giving reminders of details such as form length and printer settings.

If you use the first three or four lines of the View file to set HM, TM and BM, any reminders can be typed into these lines before the blank form is saved to disc.

These reminders will appear on the top of the screen each time the blank form is loaded, but will not appear on the printout. – **D. Driver, Winscombe, Avon.**

Barny Bee bungle

I AM a great admirer of the Get it Right! listings, which have proved to be immensely useful since they were introduced, but with Barny Bee something is not quite right.

In no way can I get the checksums to agree for lines 360, 410 and 500. And in line 730, the data will not fully enter as one group unless the DATA command immediately follows the line number.

All that results from running the program is a Bad Mode *at line 60. I transferred the program to tape and ran it, with more success, but with no left-right-up-down capacity and an ultimate message of* No Room *at line 640.*

Number Invaders typed in perfectly and runs without trouble. – **S.Moorcroft, Dukinfield, Cheshire.**

● We investigated this because our version runs perfectly, and it turns out that the program was crunched to remove spaces before we got it.

This means certain lines will not produce the same checksums when typed in as printed, nor will they work correctly. The faulty lines should be:

```
   360 IF?&8F=&C3 I%=Y%-2:P
ROCC:ENDPROC ELSE ENDPROC
   410 DEFPROCF:?&A01=24:?&
A07=8:?&A0B=Z MOD256:?&A10
=Z DIV256:CALLB:ENDPROC
   500 IFI=FALSE PROCP
```

The problem with your Data statement is tied to the *No room* error, because if you type a space after every line number you are wasting bytes, and this program – which is already tight on space – runs out of memory.

The addition of one unnecessary byte every line can make a considerable difference.

We assume that program listings are typed in with the AUTO line numbering function in operation, which gives the space between the line number and the text you type in – as shown in the magazine listing – without actually inserting it into the program.

If you do send us a listing, never use any form of line crunching on it because although the program may work it will not be possible to type it in correctly.

Pattern display

I THOUGHT the Rules for Wordwise Plus by Gary Crawford, in your July 1986 issue was a good idea, but I have not been able to make the coloured bar effect work on my BBC Micro. Wordwise Plus will not accept:

```
OS"FX155,(1+48)"
```

in any form as an embedded command. – **D.G. Paterson, Epsom, Surrey.**

● Unlike other languages on the BBC Micro, the operating system will not accept a command containing a calculation – you can only send simple numbers.

The letter meant that you should choose the colour you want, add 48 to it and put that in place of the the *(col+48)*. For example, if *n* is 1 you would use OS"FX155,49" and get red vertical lines on the screen in preview mode.

From BBC to Z88

I HAVE just finished reading Computing on the move by Dave Watts in your January 1988 issue. Unfortunately it has come about a month too late. I bought myself a Z88 in October and have been quite delighted with it.

I realised almost immediately that the major limitation was not being able to transfer data between it and the BBC Micro so I set about writing my own routines and making a lead.

It was a pity that in Dave Watts' article there was no mention of transferring data to the Z88. I would have thought that this was equally important especially with the direct compatibility of Pipedream and View Professional.

Pipedream and any other BBC Micro word processor are also compatible provided plain text is used.

Unfortunately Pipedream has one annoying feature –

LETTERS

plain text files have a Return at the end of each line. This is not a problem if you are a View or a View Professional user, but a bit annoying for users of other word processors.

This will also cause problems if you are editing Basic programs in Pipedream and the line exceeds 72 characters.

A suggestion to add to Dave Watts' article could be that instead of SPOOLing, the information is BPUT to the file. This stops the odd control characters upsetting the screen display and not going to the disc file as was intended.

Another interesting feature of the Z88 is that the diary files are plain text and can be created using a word processor. It means therefore that a diary can be created on a BBC Micro and then transferred to the Z88 for immediate use.

The proof of the pudding is that – yes wait for it – I wrote this letter on the bus coming home from work and then transferred it to the BBC Micro for final correction and printing. – **Jeff Moon, Gateshead, Tyne and Wear.**

Ultimate solution?

£10 Prize letter

The problem posed in the Education letter The slow answer *from your December 1987 issue can neatly be solved using continued fractions.*

A brief outline of the principle is given below with a program listing to solve the problem.

For the fraction .612015 the best approximation with three-digit numbers is 489/799 and is a unique solution in the sense that the next best, 377/616, differs in the last decimal place.

Type in the program and run it. Enter your target value and the degree of error your answer should be correct to – for a target of .612015 use the error value .0000005.

The display gives the number of iterations required, the two values calculated and how long it took – usually less than 0.5 seconds. – **M.J. Broookfield, Stapleford, Cambridge.**

● Thank you, that just about wraps it up for the Slow answer, unless you know any better...

```
  10 DIM P%(50),Q%(50)
  20 REPEAT
  30 INPUT"Target",A
  40 INPUT"Error",E
  50 TIME=0
  60 A%=A
  70 XA=1/(A-INT A)
  80 B%=XA
  90 P%(0)=A%
 100 Q%(0)=1
 110 P%(1)=B%*P%(0)+1
 120 Q%(1)=B%
 130 FOR I%=2 TO 20
 140 XB=1/(XA-INT XA)
  150 B%=XB
  160 P%(I%)=B%*P%(I%-
1)+P%(I%-2)
  170 Q%(I%)=B%*Q%(I%-
1)+Q%(I%-2)
  180 IF ABS(P%(I%)/Q%(I%)-
A)<E J%=I%:I%=20
  190 XA=XB:NEXT
  200 T%=TIME:@%=7
  210
PRINTJ%,P%(J%),Q%(J%),T%/1flfl
  220 @%=10:PRINT
  230 UNTIL FALSE
```

Building boots

MY micro is a BBC B and I am completely frustrated as to how to build a !boot file, as I am just starting out in computers.

Please could you explain how to build one and any way to get more than one on to the same disc at the same time? – **S. Auty, Stroud, Glos.**

● There are two easy ways to create a !boot file. Either issue the command:

```
*BUILD !boot
```

and then type in each command line, or use a word processor that can save as pure Ascii such as Wordwise, Mini Office II or a spooled View file, and save the file as !boot.

Once you've done this, type *OPT4,3 when the disc is in the drive to set the boot option to Exec. You can see which option is set when you catalogue the disc.

Four boot options are available: Off (*OPT4,0) does nothing when the disc is booted with Shift+Break, Load (*OPT4,1) loads the file called !boot, Run (*OPT4,2) *RUNs the machine code program called !boot and Exec performs the *EXEC command on the text file called !boot.

From this you can see that there can only be one boot file on disc because only one file can be called !boot.

Archimedes annoyance

I BOUGHT an Archimedes 310 with a colour monitor one and a half months ago and became annoyed when I saw the release of the PC Emulator, because I contacted my supplier who said Acorn is releasing this emulator for £99, but the price difference between a 310 and a 310M is £69.

Why levy an excess of £30 on people who were unable to take this offer up when buying? Why charge someone who has taken the risk an extra £30? By the way, my 5.25in Opus drive works without any modifications. – **S. Oakley, East Dereham, Norfolk.**

Bug lurking in Ludo

I'VE only just got around to typing in John Dewar's Ludo program from your May 1987 issue and was dismayed to find I couldn't get it to work on my BBC B.

Everything was fine until the die had been rolled to see which player was to start, and then I was confronted with No room. *This occurred even when I moved PAGE to &E00.*

The trouble lay with the statement PROCmess("") in line 870. DEFPROCmess(G$) uses the statement G=INSTR(G$,"+")-1 in line 550 and this instruction has a known bug in Basic I (User Guide page 281).

If the second string is longer than the first – which it is in this case – the effect is, as the User Guide puts it, fatal.

The cure was simple. Put a space between the inverted commas – PROCmess(" "). The same applies to the identical statement in line 190. Now all is sweetness and light.

I thought I'd let you know this in case there are any more would-be Ludo players tearing out their hair over this program. – **J.L. Bulmer, Brighstone, Newport.**

£10 Prize letter

Speed reading from roms

IN the December issue of The Micro User *A.S. Knights of Watford gave a very useful function for reading bytes*

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LETTERS

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from sideways roms.

As written it is a little slow for use within, say, a rom scanning utility, but fortunately can be speeded up considerably.

Much of the time lost is in the DIV and MOD operations needed to split up the value of location.

In fact the MOD could be omitted anyway, since the ? operator places only the least significant byte in memory, but in this particular case we can also dispense with DIV.

According to the Advanced User Guide, memory locations &F8 and &F9 are not used by Operating System 1.2, which is the most common version in the BBC B. So we can safely use the ! operator, giving Listing I. This is faster and still easy to follow.

A further saving can be made by not re-assigning the values to new variables in the function, but placing them directly where required within the definition as shown in Listing II. Shortening the name gives a further small speed increase.

The approximate time savings over the original listing are 35 per cent for Listing I and 65 per cent for Listing II.

```
1000 DEF FNreadrom(locatio
n,socket)
1010 !&F6 = location
1020 Y% = socket
1030 = USR(&FFB9)AND&FF
```

Listing I

```
1000 DEF FNr(!&F6,Y%)=USR(
&FFB9)AND&FF
```

Listing II

– **Peter Vasey, South Shields, Tyne & Wear.**

All Greek

I AM trying to learn Greek and would like to know if there is a company that sells learning programs for that language. Can you help? – **B. Harley, Meudon, France.**

● We don't know of any learning packages for Greek, but perhaps a reader does. Any takers?

Command error

I HAVE entered the listing of the Backing up to tape program from the January issue of The Micro User *and got the checksums correct, but have encountered some problems.*

The first is simple: At line 180 we have PROCcommand but at line 280 we have DEF PROCcmnd which results in the No such FN PROC *error.*

However, when I run the program the facilities to transfer disc to tape produces Bad option at 1350. *My User Guide hasn't heard of this error so I'm stuck, are you able to help?*

I notice at line 1460 there is read_attrs%=FNf_type(o$) but as read_attrs% *appears nowhere else, this seems odd. My disc system is an Opus Challenger 3 – is this likely to be the problem?* – **Alan Woodcock, Twickenham, Middx.**

● We're afraid you're quite right about the PROCcommand mix up – just change line 280 to conform to the name in line 180.

The *Bad option* error is due to the Opus drive. Unfortunately we can't guarantee that programs will work with DFSs which don't conform to Acorn's standards.

Upgrade for more words

I AM running short of memory when using Computer Concepts' Inter-Word and Inter-Sheet packages and am considering upgrading from a BBC B to a Master Turbo.

I fitted a Watford Electronics 32k shadow ram card into my computer and this increased the bytes free from around 4,700 to 25,000.

However, I now use a larger spreadsheet and the familiar No room *message is beginning to appear.*

I am considering the Master Turbo because of its processing speed and its 192k memory capacity, but I am unsure if the word processor and spreadsheet chips can make use of the extra memory on the turbo card.

I read that Acorn's View word processor relocates itself to make more memory available when it's loaded, but InterWord won't work on the second processor.

Does the turbo upgrade prove beneficial when used with InterWord and InterSheet, and if not can you tell me what the bytes free *message would read on an ordinary Master 128?*

As I am quite happy with my BBC Micro – other than the memory shortage – and I don't want to upgrade unnecessarily. Would the Solidisk Twomeg 128k or Fourmeg 256k cards be more suitable for curing my problem, as their advertisement states that the Inter series is compatible? – **Philip Tampin, Northolt, Middx.**

● To answer your last question first, the Solidisk sideways ram upgrades would not help at all as the software is not written to use it, and you already have a shadow screen.

InterWord has about 28,000 bytes free on the Master, which we assume is not much different from what you have now.

Stating that the Master Turbo has 192k available is a little misleading as 64k is in sideways ram – which would not be used – 32k is shadow screen and private ram, and the remaining 96k is split 32k for the Master main memory and 64k to the Turbo.

Only the last two can be used at any one time by word processing software unless it has been specially written. On the second processor View gains roughly another 14k of memory. However, we don't know of any spreadsheet that relocates itself to gain memory.

As far as we can see, your best bet is to optimise your spreadsheet so that it is smaller, and use InterWord's multi-file option for large documents.

ALL programs printed in this magazine are exact reproduction of listings taken from running programs which have been thoroughly tested.

However, on the rare occasions when mistakes occur corrections are published as a matter of urgency. Should you encounter error messages when you type in a program, they will almost certainly be the result of your own typing mistakes.

Unfortunately we can no longer answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the mail pages.

Scrolling stopped

I TYPED in the Text scroller routine from the November 1987 issue of The Micro User. *When run it should draw a graphics window and scroll text in it, but when I ran the program an error report was given* – Missing , at line 170.

I tried putting a comma in various places, but the final result was unsuccessful. Sometimes it reported other errors.

I don't know what's going on. Could you explain? – **Marc Lawrence, Edgware, Middx.**

● You have probably typed the number zero instead of the letter O in the variable *O%*.

Remember that error reports are not always accurate – the computer cannot know exactly what you meant to type when you made the error, and in your case there is no missing comma but something else is wrong.

Remember, too, that sometimes an error message can refer to the wrong line.

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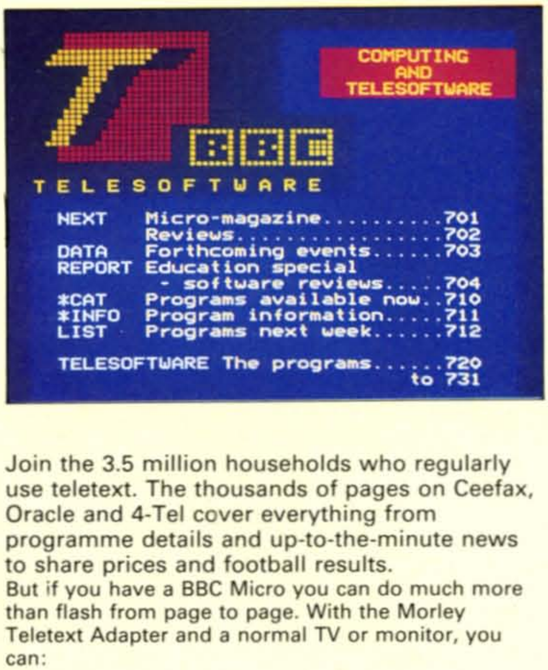

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What you get

The stylish teletext unit, 16k ATS rom, 16k utilities rom (including printer dumps), two manuals and a utilities disc. An optional power supply is available.

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Note: If you use your BBC Micro's auxilliary power socket for your disc drive, or any other external device, you will need a power supply which we can provide for £9.95.

All prices include VAT and P&P.

IMPORTANT: The BBC points out that a teletext adapter, like a TV set, will not work satisfactorily without a good outside aerial. Nor will it function correctly if you experience reception problems such as ghosting.

They emphasise that these problems only affect a few areas of the country. However if you have any doubts as to the quality of signal available in your area you should contact the BBC Technical Support Service on 01-927 5040.

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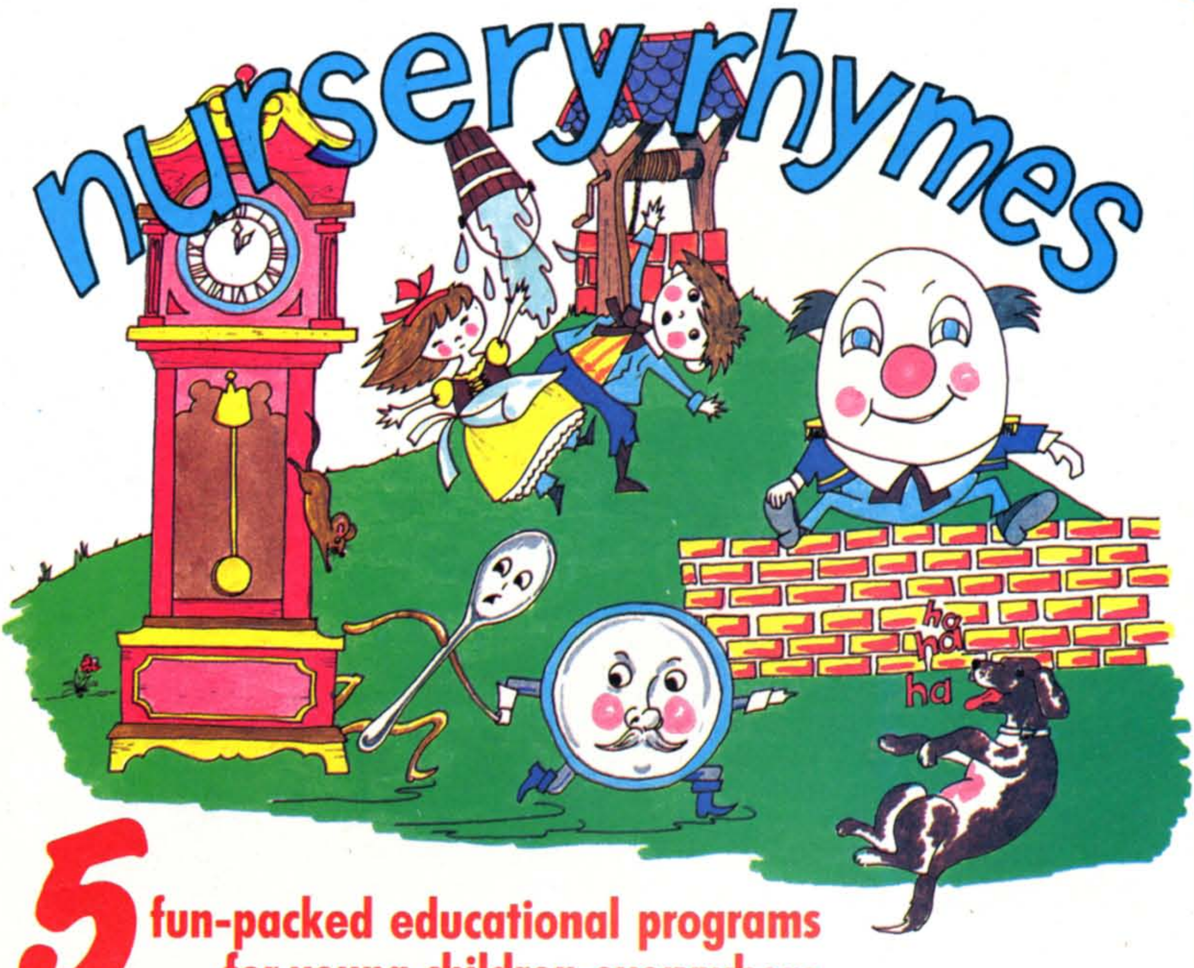

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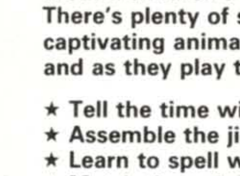

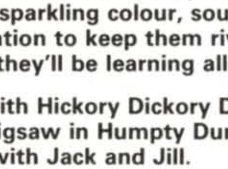

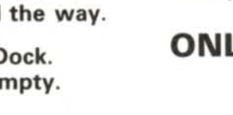

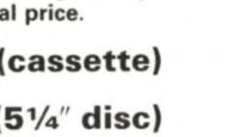

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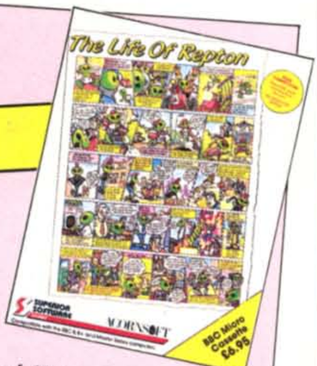

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(see page 157)

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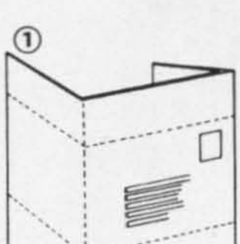

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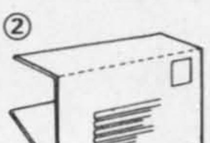

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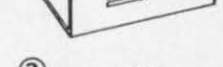

Leaky listings solutions

The variable *num$* in line 180 should be in lowercase:

```
180 l=LEN(num$)
```

When going backwards in a FOR ...NEXT loop you need the STEP command. In line 190 it should be STEP −1:

```
190 FOR n=l TO 1 STEP -1
```

There were two mistakes on line 200. Firstly the 1 must be in quotes because we're checking for a character not a number and, secondly, there shouldn't be a space between PROC and *ans*:

```
200 IF MID$(num$,n,1)="1" PROCans
```

The wrong variable is specified following the NEXT in line 210. It should be *n* not l and need not be there at all:

```
210 NEXT n
```

It's not a mistake, but the variable l used in lines 180, 210 and 260 is badly chosen as it can easily be confused with the number 1.

Another point to remember is not to leave too many spaces in strings. An example of this is line 220 where the spaces in the string should be replaced using the SPC command. This makes your spacing more defined and it is a lot easier for other people to type in your printed listings.

Finally, you should have noticed that the program in fact converts from binary to decimal, so the REM statement in line 100 is wrong:

```
100 REM Binary to decimal converter
```

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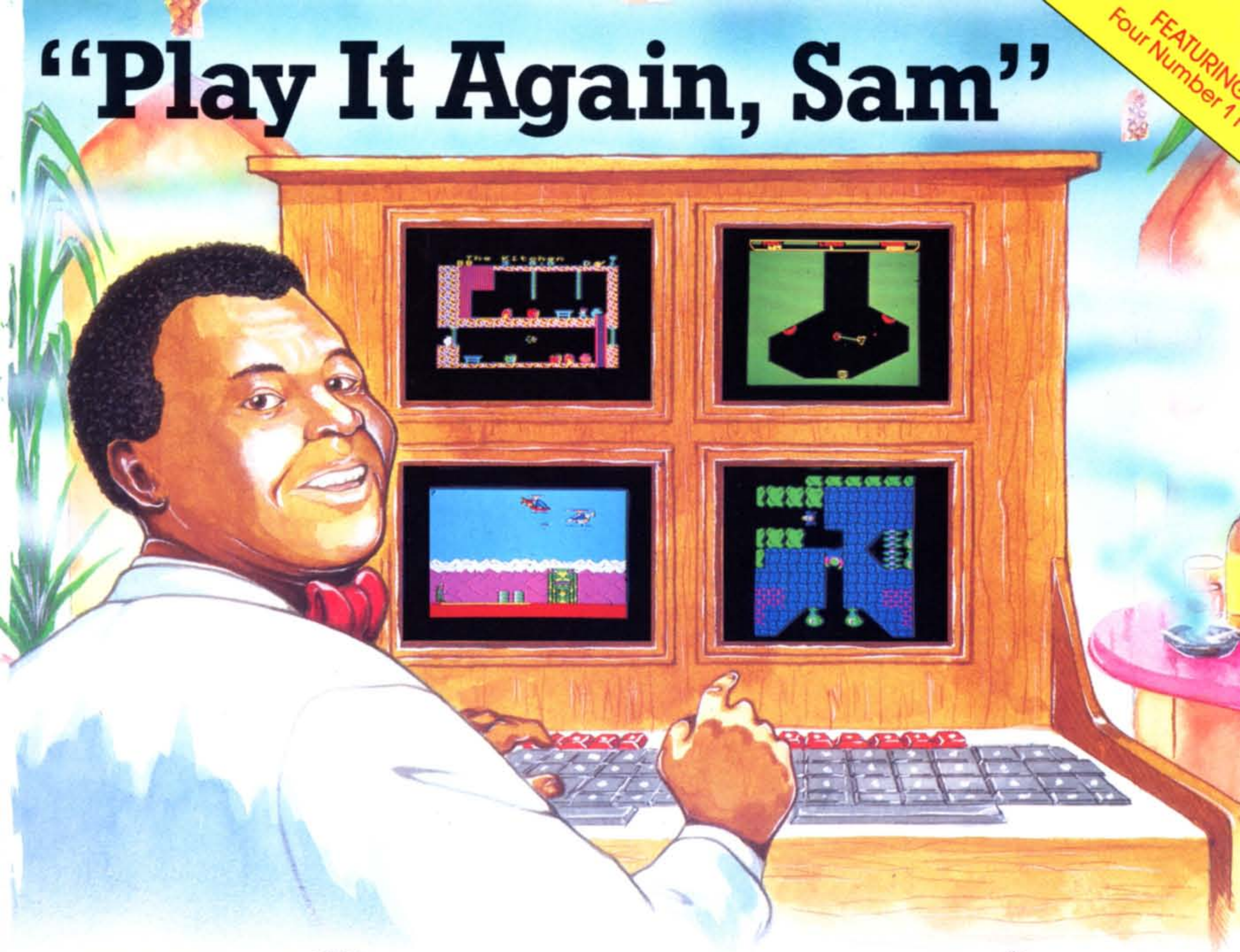

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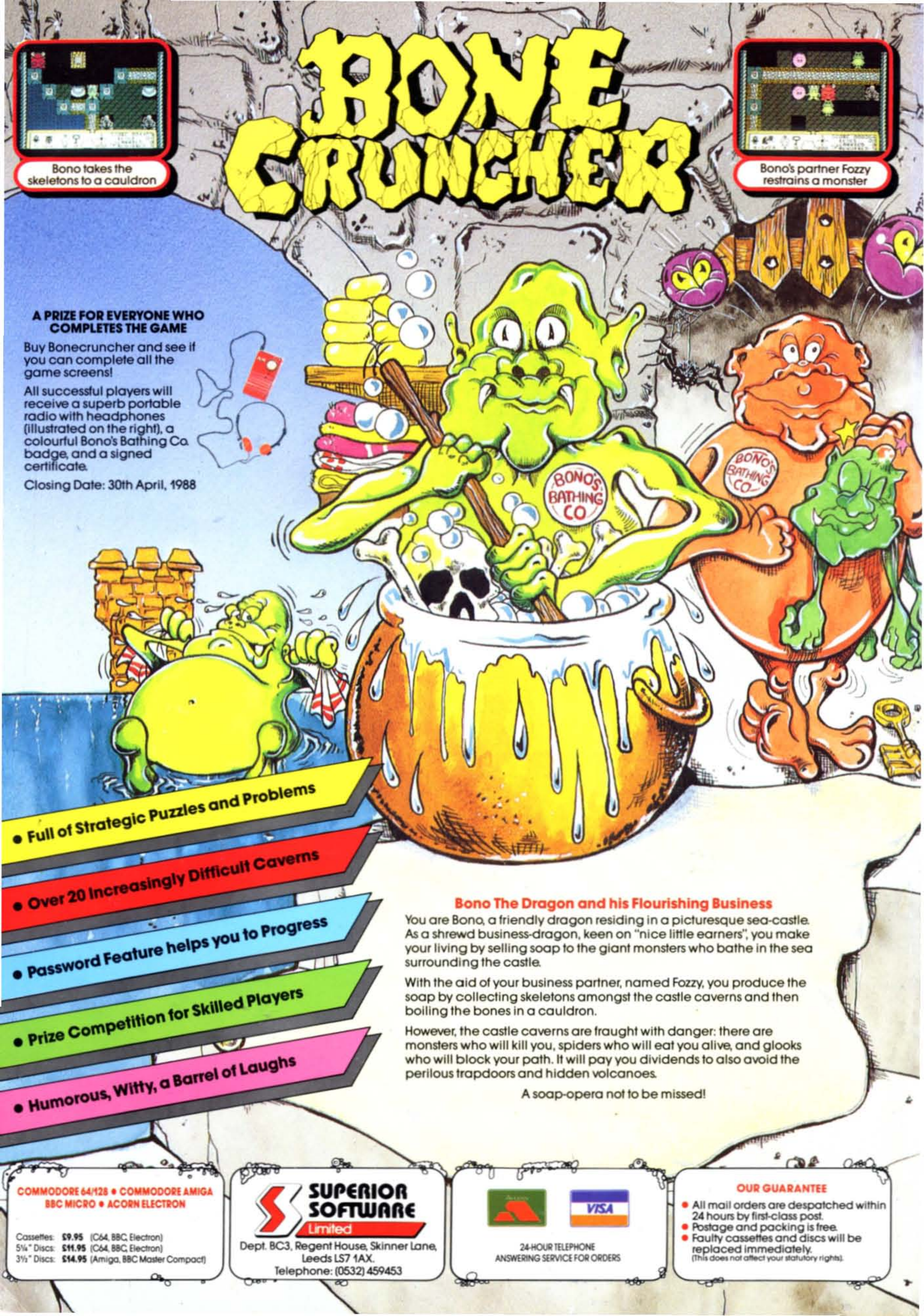

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